JOURNAL OF GAS LIGHTING, WATER SUPPLY, &c.

EDITOR & PUBLISHER: WALTER KING. OFFICE: 11, BOLT COURT, FLEET ST., LONDON.

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EDITORIAL NOTES—GAS, &c.

The Meeting of the German Association.

THE meeting of the German Association of Gas and Water Engineers, which was held at Mannheim from Tuesday to Saturday last, proved notable in several respects. The festivities in connection with it were carried through on the grand scale which is now always associated with these gatherings, and which only becomes possible because of the large muster of members and guests. In the meeting last week, 1024 persons participated. The town of Mannheim was in gala dress—all the principal streets being bedecked with garlands of evergreen and festoons of ribbons; while there were many decorations of a more permanent character, which had been carried out earlier in connection with the Exhibition of Art and Horticulture that is being held in the town this summer.

It is, however, in regard to the technical proceedings that the meeting more particularly deserves special notice. The carbonization of coal formed the principal theme; and it was discussed from several points of view. Mr. E. Körting described the new retort-house (specially designed for vertical retorts) at the Oberspree works in Berlin of the Imperial Continental Gas Association; while Herr Preuger, the Manager of the Cologne Gas-Works, gave an account of the installation of vertical retorts which has just been completed there. The latter is by far the largest installation of such retorts yet erected. It comprises 240 vertical retorts on the Dessau system, as are also those at the Oberspree works. In connection with the paper by Herr Körting just referred to, there are available a few interesting figures as to the results of the working. The works are small; and therefore an engineer or chemist cannot be specially kept there. Another drawback affecting the working is that, with such units as are here installed, the furnaces cannot be operated to their best advantage. In spite of this, however, Herr Körting gives the assurance that they have occasioned no trouble whatever; and this he regards as the best proof that verticals have passed the experimental stage. As to the results, there have only been vertical retorts in action at the Oberspree station since the end of March; so that the figures are as accurate as they can be. The usual amount of tar was formed, 5 per cent. by weight; and, compared with horizontal working, there was an increase of 40 to 50 per cent. in the ammonia produced—this result being the average of two months. The coals carbonized were those ordinarily used; and their yield was 13,000 cubic feet of gas per ton, and 14,800 cubic feet per retort per day. The average calorific power was 550 B.Th.U., at 30 inches barometrical pressure and 60° Fahr. The coke remaining for sale was 54 per cent. by weight. These results were quite what Herr Körting hoped to get; hence the large installation at the Mariendorf works of the Imperial Continental Gas Association is being put up on exactly the same lines.

By way of antidote to this strong dose of vertical-retort literature, Herr Ries, the Manager of the Munich Gas-Works, gave an interesting account of the novel inclined large carbonizing chambers which he has designed and has had in action for about a year. He claims that they secure great economy of labour; and while the carbonizing results which he quoted are not better than those which have been obtained from older forms of retort, it must be conceded that his chamber carbonizers left a very favourable impression on the meeting. The most striking point now about the Dessau vertical retort-settings appears to be the rapidity with which they are being adopted in many Continental gas-works, and the large size of some of the later installations. But the information available in regard to their working does not appear to justify their immediate adoption as the staple carbonizing plant on gas-works; and it would be very interesting to have a precise statement of the reasons which have led the gas managers of the undertakings where the larger installations are, to adopt these settings forthwith on such a scale.

Several speakers made disparaging remarks about continuous carbonization, apparently only because there are many difficulties to be overcome before a satisfactory system shall have been devised. Meantime, the larger German manufacturers of gas-works plant are having a very busy time in erecting installations of vertical retorts, and in supplying machinery for inclined retorts and for handling coal and coke. It is difficult to understand how anyone but the manufacturer will be appreciably benefited by the erection of much of this plant, on which the wear and tear is very heavy, and the initial outlay great. In the majority of cases, it is, of course, the municipally-owned gas-works which incur the most lavish expenditure on new and comparatively untried plant.

The meeting was also noteworthy because the first-fruits of the establishment by the German Association of Gas and Water Engineers of an experimental gas-works were brought before the members, in the nature of a report of the results of exhaustive analyses of a large number of German gas coals. The installation is clearly destined to be a boon to the smaller German gas-works, and incidentally to those of other countries; and a visit to it on Saturday last left a wholly favourable impression of it.

Many other matters were dealt with, as will be seen from the report of the proceedings given in the "JOURNAL" to-day. The only fault—and it is a venial one—which can be found with the meeting is that the technical programme was too long, and discussion of the papers was either altogether avoided or greatly curtailed. It would, however, be better if the Association would follow the English method of furnishing advance proofs of all the papers before the meeting, so that members would be better prepared to join in the discussions.

The Annual Congress of the Société Technique.

FROM the full review of the proceedings, given in the present issue, of the thirty-fourth annual gathering of the Société Technique du Gaz, held at Nancy last week, the chief features of the meeting can be gathered. It is notable, perhaps, not so much for what was actually done, as for what was proposed and inaugurated. There were fewer papers read than usual, and they—with the exception of the one by M. Casaubon, of Brussels, on the diffusion of gas flames—contained nothing particularly new or striking. The Presidential Address of M. André Coze, whose name is indelibly associated with inclined retorts, contained no reference to that or to any other system of carbonization; and on this account English gas engineers might have listened to his address with feelings of some little regret and disappointment. But *autres pays, autres mœurs;* and so it may also be said, *autres sociétiés, autres discours.* Of the President's conduct in the chair, however, there could only be one opinion; it was admirable in the extreme. Punctuality, firmness, patience, and impartiality were all marked characteristics of M. Coze's management of the meetings and debates. He kept men and matters strictly to the point. He aptly phrased expressions of opinion and of thanks, and frequently voiced just the right feeling of the members. In short, he proved a very excellent President in every way; and his second year of office will be looked forward to with pleasure.

In reviewing the proceedings of our French colleagues in past years, the general paucity of debate upon the technical papers has more than once been commented upon. Perhaps it is partially to remedy this defect that this year's Congress sees the inauguration of a "Séance de Discussion," or what may be termed a Debating Conference. We think the idea is a very good one; and though we gather that the first conference has not led to any very practical or definite result, or elicited any fresh facts, its importance is certainly

not to be underrated, and its utility, we trust and believe, will be increased in future years. We would point out, however, two pitfalls to be guarded against. The first is the danger of superficially debating many subjects instead of thoroughly exhausting a few. The second is the liability of the debates to be carried on by a limited circle of members, generally belonging to the older generation, instead of them being participated in to a greater extent by the younger and more numerous members.

It will be noticed that in the discussion on the standardization of screw-threads of gas fittings and apparatus, a harmless sort of resolution was adopted, "expressing the "wish" that the various technical societies would investigate the matter. But we are under the impression that some such pious wish was given expression to at the International Gas Congress in 1900; or certainly by the International Photometrical Committee in 1903. Seven, or four, years have since gone by. Is there really any life in these dry bones of international standardizing? Or is it merely a beautiful theoretical idea, with no body of public opinion behind it?

However this may be, we are very pleased to state that at this week's meeting in Dublin of the Institution of Gas Engineers, personal embodiments of international goodwill and of the cordial friendliness existing between French and English gas engineers will be found in the presence there of M. Henri Marquisan, the Honorary Treasurer, and (though perhaps later on) of M. J. Payet, the Permanent Secretary, of the Société Technique. It is certainly not necessary to assure these representatives of the French Gas Society of the pleasure and heartiness with which they will be welcomed. Of M. Marquisan's great success as a Treasurer, the yearly financial statements, showing the prosperity of the Société Technique, bear witness. Of M. Payet, both as a capable engineer and as an indefatigable and ever courteous Secretary, nothing more need be said, except to draw attention to his technical papers (which thoroughly merited the prizes awarded him this year); and to the pleasant and successful Congress just over, the smooth working of which was largely due to his organizing ability.

An Inevitable Increase.

Although they have striven hard, and fought stubbornly in defence of their gas consumers, the Directors of the South Metropolitan Gas Company have had, with reluctance and regret, to succumb to overpowering circumstances, and give notice of an increase of 3d. per 1000 cubic feet in the price of gas as from Midsummer. This is unquestionably the greatest disappointment the Directors have had to face, as the 2s. price which they introduced into London at Midsummer, 1904, they had hoped to be able to maintain. But the unexpected happened. Coke fell in price, coal rose in price, and rates under the Progressive misrule of local affairs in the Metropolis continued to ascend, with the consequence that the Company, instead of being able to make both ends meet, and reserve undivided balances for more burdensome times, were compelled to sacrifice the £65,000 balance that they held at June, 1904; until last year (of course, without touching their reserves) there was a net deficiency of £9000. The while proprietors have not received the full dividend —£5 14s. 8d.—to which they were entitled, but have been well content with 5½ per cent. The consumers will see from this that the Directors have done their utmost, but have had to resign to unyielding conditions, which include the considerable rise in the price of coal this year.

It is this rise in the price of coal that has at length forced the Directors to advance the charge for gas. The coal contracts made in April last year were 1s. per ton higher than in the preceding year, or at an average price of 8s. 3d. per ton. But this year, although the Company diverted some substantial purchases of coal to the cheaper of the markets, the rush to those markets compelled them again to turn to Durham, where they lately bought at 12s. per ton. The result is that the cost of coal, under the new contracts, will be (giving a round figure) 3s. 6d. per ton more than under last year's contracts, which, on the 1,181,239 tons of coal carbonized last year, represents the large sum of £207,000 (compared with two years ago, the increased cost will be some £240,000). A 1d. advance in the price of gas is equal to about £52,000 a year; so that the 3d. increase will bring in something like £156,000. Unsupported, this is short by (say) £50,000 of the extra cost of coal; but as with this 3d. increase, the shareholders will forego 3s. 4d. per cent., this will provide another £11,000, or thereabouts. The employees, too, sharing in good and ill, will receive at least £10,000 less bonus. The proprietors and employees will therefore suffer in unison with the consumers. The ordinary variations in trading will doubtless more than cover the deficiency; so that it may be assumed that the Company's reserves will be unaffected. We have not taken into consideration here the question of the effect of the Company's new assessments, seeing that the matter, through the Company's latest move (reported last week) is *sub judice*.

However, we cannot refrain from regretting that such an increase as 3d. in the price of gas has proved inevitable; but the South of London will still be enjoying a cheap gas service. It is, through the circular reproduced elsewhere, being made perfectly clear to the consumers that the additional £150,000 they will have to pay this year is due to the increase (despite the efforts of the Directors to modify it) in the Company's coal bill for the year. We hope sincerely that better conditions will soon prevail, and that it will not be far in the future before the Directors are able to revert to the 2s. price. That is the price the Company have set themselves as their standard.

The Smoke Nuisance, and Smokeless Fuel from Gas-Works.

In another part of this issue, a special article appears on the subject of the provision of a smokeless solid fuel, of a somewhat better description than ordinary coke, for domestic use. The Gaslight and Coke Company have been making an experiment in this direction, and have satisfied themselves that they are in a favourable position—if there is the demand, and people are prepared to pay prices even rather below those currently mentioned for Coalite—for meeting that demand. It is all a question of price as to whether or not it is worth the while of gas suppliers to partly break through traditional and approved practice, and enter into this fresh description of business. The cultivation of the gas-heating branch of the business must always take first place. Ordinary coke will command its present markets on account of price, and in some instances on account of the absence of those very qualities that are present in smokeless fuel or incompletely carbonized coal—such as Coalite. But there are people who will not have gas or the commonly produced coke for heating; and, as sellers of coke, gas makers may find it an advantage to their ordinary coke market to satisfy these people, and have a demand for a partially spent material. The matter is at any rate worth consideration; and the demonstration of the Gaslight and Coke Company will undoubtedly induce others to inquire into the matter.

The question of the use of smokeless fuel is a very live one at the moment. The Smoke Abatement Society have been more active than ever of late; and a little missionary enterprise from that enlightened country of America to this benighted country of Great Britain has been commenced, and is intended to convict us of the error of our heating ways, and incidentally to persuade gas suppliers to adopt the coke-oven system, so that any grade of coke for any purpose—from the domestic fire to metallurgical requirement—can be provided. It is, of course, very considerate of our American cousins to take this interest in us; and it is hoped that we are all duly grateful to them for attempting to impose something upon us that has little, if any, possibility of successful application in gas-works in this country, except perhaps on a very limited scale in certain specially circumstanced areas. The London County Council, too, have now awakened to the fact that the smoke nuisance in London is a real one; and they are proposing an amendment of legislation to give increased control over smoke from industrial chimneys, locomotives, and Government factories, and to constitute the County Council the central executive authority for dealing with the smoke trouble. They have also got their eyes on domestic chimneys; but they are going to be benevolent, and give householders a little further time for mending their ways. They have, however, already issued a warning, but trust that public opinion will bring about some radical improvement without compulsion. In a report that has just been issued by the Public Control Committee of the Council, it is estimated that half the smoke in London comes from the domestic chimney. But it is expected that a great reduction of the nuisance may be looked for through the growing use of gas and electricity for the purposes of heating and cooking, "as it has been found that nearly half-"a-million gas-cooking stoves are now in use in London,

"and their use is steadily increasing." Of course, the figure named does not include gas-fires, nor privately owned cookers, so that it is below the mark. The Committee are of opinion that good would also accrue from instruction being given to children in elementary schools in the principles of combustion, so as to make them grasp the fact that smoke is not inevitable, but often the result of the wasteful use of fuel. This increased attention to the subject of rendering the air of our cities and towns more healthful by the greater use of gaseous and smokeless solid fuels furnishes the best reason why gas makers generally throughout the country should ascertain whether there is a paying business to be done in the direction in which the Gaslight and Coke Company are bestowing attention.

Relations Existing between Officials, Councillors, and Directors.

THERE have been, during the past few years, some very striking ruffling here and there of the long-established complacent and co-operative relations existing between officials and superior administrative authority in the gas industry. The incidents happily are few. But as we say they have been striking, and, moreover, their frequency is growing; and, when cause and effect are dispassionately examined, it is found that neither bodes good for the future. There are undercurrents at work that are increasing in strength; and, as they so increase, the erosion and the undermining of stability, responsibility, energy, enthusiasm, and good feeling, are also greater. In most cases, this is due to some mistaken notion as to the duties and responsibilities of the executive officers, and to the subjection in public administration of the commonweal to faction and to class prejudice. This is a course of the affairs of the present day which we would wish to see turned; and a few considerations may perhaps be helpful.

In the after-luncheon speeches made at the visit of the Southern Association of Gas Engineers and Managers to Bournemouth (reported a fortnight ago), there were a few sententious utterances that incite thought in more than one direction—more particularly when they are brought to bear upon the incidents in mind relative to the attitude of elected authority towards officials. It was remarked by Sir George Livesey that, so far as gas companies are concerned, they are passing through strenuous times, and the same remark applies, but in a lessened degree, to the gas undertakings of local authorities; for many of the difficulties that obsess gas companies are, it must be admitted, of the sowing of local authorities. But Sir George also said that the position of the gas manager, engineer, or secretary is not what it used to be. That is our special point. It is true; but Sir George, we judge, was speaking of responsibilities and duties from the technical and commercial aspects. But while duties and responsibilities, technical and commercial, have increased, and therefore, while those above officials should be more helpful, we regret to know that in many instances in the municipal branch of service—though happily not by any means in all instances—the tendency has been to harass officials and endeavour to bring opprobrium upon name and reputation, and, from a section of the community, ridicule and contempt. The change from the old amicable and mutually helpful relations has been produced by the change in civic representation. Instances of the indignities to which engineers and general managers of municipal undertakings have been subjected spring freely to mind. There is one in which a socialistic bigot thought that the engineer and manager was worthy of his suspicion, and suspicion engendered a system of espionage, and a continual string of reports and inquiries as to the movements of the official concerned. In another case, discipline and authority at the works were largely affected by intemperate language in the Council Chamber regarding almost every act of the manager in attempting to maintain both, and in conscientiously and circumspectly discharging his duty as between employers and employed. In another case, an engineer and manager has been heckled more than ever during the past few years, and a large part of his time has been diverted from more important matters, and spent in preparing reports upon the most trivial details. In yet another case, the technical chief of a gas undertaking used to be—we do not know whether it is so now—compelled to stand outside the door of a committee room (where he was at liberty to associate with the porter in attendance), ready to be called in and questioned on matters of detail, while the dignitaries deliberated and decided upon all kinds of matters upon which the guidance of the technical chief, according to the trend of the discussion, should have been invaluable. There is the outstanding instance of what we chose to describe as the recent persecution—not by the special representatives of labour, but by others—of the chief official at Nottingham on grounds that two Committees of Inquiry declared to be baseless.

These are only examples covering many others. And while this is a condition of things that is increasing in its severity so far as managers and engineers of certain towns are concerned, the duties and responsibilities of those engineers, technically and commercially, are also increasing. The reflection is not a comfortable one. We ask, how can an official, under such subjugating and disturbing circumstances, give of his best, sustain energy and enthusiasm for the duties and responsibilities attaching to his appointment, and maintain independence of action, even in the most commonplace affairs? He cannot do it. The treatment is subversive of all good feeling and desire to make one's work as productive as possible. That is an effect that is produced by suspicion, espionage, and harassing on the part of those whose sense of self-esteem and self-importance is ludicrous, and of those who, swayed by political or class motives, let justice go to the wall and the common good be sacrificed to party or class selfishness. No man in the administration of local affairs, especially of a public trading enterprise, should be such a liege servant of party or class as to cause the general public interests to take second place. The cranks in local affairs we have always had; and upon them, with a good majority of reasonable and sentient beings on a local authority, one can afford to smile good-naturedly. But the new order of local administrators, who think that the municipal gas undertaking and everything else should be run for the few, who treat (as being an essential part of the objects for which they were elected) the executive officials as though they were the enemies and not the representatives of the people, who do all they can to belittle the position, duties, and responsibilities of such officials, and whose actions divert attention from those duties and responsibilities, and make things generally uncomfortable—those are the men who, if they were not so blinded by conceit, selfishness, and uncharitableness, would see that they themselves were the greater enemies of those whom they are seeking, by erroneous and crooked ways, to serve. The result of such "representative" service is but small; the greater good for party or class may be secured by working with more liberal mindedness for an end which produces the maximum value for the greatest number.

If there was enlightenment, there is not the slightest reason why the position of gas manager, engineer, or secretary, in all municipal service, should not be—other than in respect of the increased pressure of duties and responsibilities in these times—every whit as pleasurable as it was of old, and as it is in most cases in company service, though in certain places, in company service, we know where parsimony is more in evidence than gratitude, and where, through the same cause, managers and engineers are actually not given the opportunity of doing their best for their undertakings. The gas engineer and manager should have full scope allowed him for the exercise of his faculties; and where this is granted, there we find the greatest prosperity, and the soundest conditions prevailing. "The one thing "we have ever striven to do has been to select good men, "and, when we have selected them, to give them our full "confidence." Those were the words of Mr. G. Crispe Whiteley, the Chairman of the Bournemouth Gas and Water Company, on the occasion already referred to; and the Company have found the policy to work well. They have even gone beyond that, as certain other companies have done who could be named. The Company have, indeed, done a large and (we may say without extravagance) an invaluable part in permitting their Engineer, Mr. H. W. Woodall, and his quondam assistant, Mr. Duckham, to turn a portion of their energies and enthusiasm on to the work of technical advance in the industry; and the confidence, privilege, and opportunity have not been abused. On the contrary, such confidence, privilege, and opportunity must, with all conscientious men, bind their interests tighter to those whom they officially serve, and act as a spur to the utmost fulfilment of duty and responsibility. Confidence—not the confidence that is given to obtain relief from personal obligation, but reasonable confidence—begets confidence; and officials will as a rule, and with few exceptions

to the rule, be found responsive, and will make every effort to show that the confidence is not misplaced. Initiative, perseverance, and a jealous care of interests are the growths of such confidence, to the common benefit. Where such conditions obtain between a Board of Directors or a Committee and the officials, there the same conditions will more frequently than not be also found to obtain between the officials, the staff, and the workmen. "Good masters ever "make good servants." Such leaven soon spreads; and we want more of it.

What certain occurrences have led us to wish to impress is that the highest interests are best served where harmony and consideration exist in the relations between the administrative authority and the executive officials. This is a truism; but it is apparent that it is sometimes forgotten, or wilfully disregarded in the pursuit of some unreasonable or narrow-minded object.

A View of Profit-Sharing.

"Profit-sharing is like advertising—it takes time to show results; but it can, like advertising, meet with astonishing success." This sentence concludes an interesting article dealing with the subject of profit-sharing (for which the schemes as introduced by Sir George Livesey in connection with the South Metropolitan and South Suburban Gas Companies, as well as that of the Commercial Gas Company, form the text), which appears in the "Joint-Stock Companies' Journal." As the quotation shows, the writer is strongly in favour of this now well proved means of uniting Capital and Labour, and so preventing disastrous industrial conflicts; and the scheme of the South Metropolitan Company and its results (with which "JOURNAL" readers are familiar) are set forth to show how much can be accomplished. Surprise is expressed—in view of the great success that has been experienced wherever a proper system has had a fair trial—that so few companies have yet fallen into line and adopted profit-sharing, or taken any means of that kind for improving the lot of their employees and at the same time benefiting their shareholders. It is pointed out that it is possible so to vary the system of distributing bonuses that any company can protect themselves in the most certain manner, and that there is no doubt about it proving profitable—both in the case of steady, prosperous undertakings and those whose returns show a tendency to decrease—to offer the employees a bonus for every increase in the dividend. Co-partnership, as completely practised by the South Metropolitan and South Suburban Companies, has, the writer says, much to recommend it; and it certainly educates workmen to become thrifty with the most beneficial results, for a thrifty workman is invariably intelligent—a fact to which anyone who works among them will testify. But for obvious reasons, he adds, the system, though applicable to most undertakings, is more suitable where regular hands are constantly employed. With all its advantages, however, it is a fact, as already mentioned, that profit-sharing has not been very extensively adopted by gas companies. Such articles as the one to which attention is now being drawn would be welcome under any circumstances as advocating a good cause; but they are rendered doubly so by the fact that this advocacy appears to be greatly needed.

A Commercial Audit of Municipal Trading Accounts.

Municipal authorities throughout the country would save themselves a lot of odium if they would take a leaf out of the book of the new London County Council, and submit the accounts of their trading enterprises to a real commercial audit and report, quite apart from the official audit to which municipal accounts are usually subjected. The Finance Committee of the London County Council submitted last Tuesday a report on the subject of such an audit, in compliance with an instruction given them some three months ago. They recommended that the President of the Institute of Chartered Accountants (in conjunction with a member of the Institute to be nominated by him) should report upon the trading enterprises of the Council, especially in respect of the past results and present position of the undertakings from the financial point of view, and on the sufficiency of the existing renewal funds, the formation of further reserve funds, and the relation of these to the statutory sinking funds; while Mr. Edwin Waterhouse, it was proposed, should be asked to report, in continuation of one he made in 1897, on the Works Department of the Council. This commercial audit is not in any way suggested as a reflection upon the accuracy of the figures put forward by the Council's officials; but for the purpose of enabling the men now in power at Spring Gardens to run the concerns on such financial principles as expert judgment says is right and proper. The Progressives worked the concerns according to the best of their lights; but their judgment may not have been in accordance with the views of any higher authorities than themselves. There is no desire whatever to cast, through a commercial audit, contumely upon the predecessors of the present majority of the Council. But although this was lavishly protested from the Moderate side of the Council Chamber on Tuesday, the Progressives fought tooth and nail against the proposal, and opposed amendments to every recommendation of the Finance Committee. Why this? They gained nothing by their hostile procedure; but their opposition provides ground for thought.

Corporation Results.

The news pages of the "JOURNAL" just at the present time are, as is usual at this period of the year, largely occupied with chronicling the results attained by the past twelve months' working of municipal gas undertakings—that is to say, to March 31 last. There is, on the whole, considerable cause for congratulation shown in the reports presented, though, of course, the price of coal has been a disturbing influence, and threatens to prove still more so during the current year. At Widnes, the quantity of gas made in the past twelve months was 8·3 per cent. more than in the preceding year, and the profit was £551 more, in spite of the fact that in September the price of gas was lowered 1d. per 1000 cubic feet to ordinary consumers, and 2½d. to slot-meter users. The cost of production amounted to only 11·39d. per 1000 feet. Coal is expected to cost £4000 more this year; but still the Committee hope they will be able to retain the price of gas at its present low figure—and no doubt the consumers hope so too. At Devonport, Mr. J. W. Buckley, the Engineer, has effected considerable savings; and his reward has been an increase of salary. Burslem has enjoyed a record year in every respect; and here, again, the Manager, Mr. Edward Jones, has had his salary increased. The estimated profit at Bury has been exceeded by £1500; the amount (£7517) being divisible equally between the consumers and the general rate. Southport, also, reports a slightly higher profit than was estimated; the sum available for the borough fund being £13,000. The capital expended per 1000 cubic feet of gas sold, and that outstanding, exhibits a satisfactory decrease. At Belfast, the profit is not quite so large as was the case in the previous year; but in this there is no cause for misgiving, as the falling off is more than accounted for by the increase in discounts and the decrease in price of gas to prepayment consumers. There was an increase in the quantity of gas made at St. Helens of 5·4 per cent.; and Wigan also is able to chronicle a substantial gain in this respect. These are only a few points from the many which the reports contain; but they will suffice to prove that there is room for satisfaction, though naturally in some places rises in price are being found necessary.

Visit of Water Engineers to Paris.

At the close of the report of the proceedings at the meeting of the Association of Water Engineers which appeared in the last number of the "JOURNAL," it was mentioned that a party of the members were spending in Paris the week just closed, with the object of inspecting the various works from which the city is supplied with water. The programme prepared was an interesting and highly instructive one. On Monday, the party were taken to the works of the Compagnie des Eaux de la Banlieu de Paris at Suresnes and Mont Valérien, over which they were conducted by MM. Chaudoir and Chabal, the Manager and Engineer respectively of the Company. In the evening, there was a reception by the President (M. Cornuault) and Council of the Société des Ingénieurs Civils, at their rooms in the Rue Blanche, followed by a *conversazione*. The members were very cordially welcomed by M. Cornuault, whose address (delivered in English and in French) was acknowledged by Dr. Adolph Kemna, the Vice-President of the Association, in the absence, through illness, of Mr. Sainty, the President. On Tuesday, the party inspected the Paris sewers and pipe subways, and visited the pumping and filtering stations of the Compagnie Générale des Eaux at Choisy-le-Roi. The arrangements for the three following days included visits to Versailles, to see the ancient pumping plant; to the Montsouris and Montmartre reservoirs and the arcades of Arcueil; and to the pumping-stations and filter-works of the Municipality at St. Maur. The party returned to London on Saturday. The whole of the arrangements for the visit were made by Dr. Kemna, Mr. Easton Devonshire, and Mr. Percy Griffith, the Secretary of the Association, and they were carried out most satisfactorily.

THE INSTITUTION OF GAS ENGINEERS.

ANNUAL MEETING, JUNE 18, 19, and 20, 1907.

INAUGURAL ADDRESS OF THE PRESIDENT,

Mr. Charles Hunt, M.Inst.C.E.

Gentlemen,—My first endeavour must be to thank you, which I do most sincerely, for the very great honour conferred upon me by my election to this chair—an honour which I esteem all the more highly because of my previous occupation of it. I am indeed proud that the memory of that time (more than a quarter of a century ago) has not stood in the way of my again appearing before you in a similar capacity.

The subject which brings us together on these occasions is one that, if not always uppermost in our thoughts, at least claims from us an allegiance that will brook no rivalry. "Art," it has been said, "is a jealous mistress;" and the saying is also true if applied to the more utilitarian pursuit of which we are followers. Whether, however, it be altogether a fortunate circumstance that your President is impelled to confine his remarks to this one subject, may be open to question, having regard to the great number of Presidential Addresses which have been, and continue to be, devoted to it—greater by far than obtains in the case of any other branch of engineering. It has indeed been irreverently suggested that there exists a connection between this stream of oratory and that "wild spirit or breath," which Van Helmont found to "belch forth" from certain substances when confined in close vessels and submitted to the action of heat, and for which he could find no more appropriate name than one which seems to have been derived from a German word signifying ferment, yeast, froth, or foam. Be this as it may, it is certain that whoever may be called upon to sustain it is entitled to the sympathy and forbearance of his audience, and most of all he who now stands before you to deliver his seventh contribution to it.

What, then, can I hope to say that has not been said already (and far better than I can say it) by one or other of my many and distinguished predecessors in this chair? What message have I to deliver that has not been delivered already? I confess that I do not know, and feel myself constrained to follow the beaten track. In doing so, I shall consider myself fortunate if I am able to impart any degree of fresh interest to familiar themes; fortunate, indeed, should that interest prove to be anything more than transient.

The Special Purposes Fund and Investigation.

Just twenty-six years ago was held the final meeting of the original British Association of Gas Managers, over which as it happened, I had the honour to preside. I speak, therefore, with some authority when I say that the organic changes which were then introduced, and the alteration of title to that of the "Gas Institute," were indications of a very keen desire for a wider, and if possible a higher, sphere of usefulness than was believed to be attainable under the older and more primitive organization. It proved to be, in reality, the first step towards that much more complete and radical re-organization which was only to be reached after years of weary wandering in the wilderness of separation, and the finishing touch to which was only put two years ago by the affiliation of the District Associations. It needed but this to complete the formation of a wholly united body such as had long been ardently desired. "What the gas industry wants above all things," it had been constantly urged, "is a thoroughly representative body. Because you are divided, but little notice is taken of you; but if you will only sink your differences, so that you are able to speak as with one voice, you cannot fail to make yourselves heard." The soundness of this advice has already become apparent in the record of really useful work which, under the new conditions, your Council have placed to their credit.

But perhaps the most conspicuous result of its adoption has been the revival of the movement to which I have just referred as having taken place in the early eighties of the last century. Then, as now, an appeal was made to the owners of gas undertakings to furnish the necessary funds for carrying on investigations; then, as now, also, the appeal was but partially responded to. There need, however, be no discouragement at the comparatively modest sum-total which has been placed at the disposal of the Council—more, by the bye, than three times the amount which resulted from the earlier appeal. I feel convinced that if this is economically administered, and full value for it secured in the shape of results, no lack of funds need be apprehended. The Council have been taken to task for the alleged indefiniteness of their appeal, but an objection which occurs to me is of an opposite kind—namely, that the appeal defined, not insufficiently but too clearly, the purpose for which the fund is required. Almost before the ink with which it was written was dry, it became apparent that other matters were likely to engage the attention of the Council from time to time, of perhaps pressing importance to the industry, for dealing with which there are no other funds available. A case in point was furnished by the Home Office inquiry in connection with the proposed regulation of private sidings, at which the Institution was represented with the general concurrence of the members. No serious objection can be made to the expenses which were thereby incurred (or to any similar expenses) being defrayed out of this fund; but it should be clearly understood by the subscribers that this is in reality a Special Purposes Fund, for use in connection with any object that may concern the welfare of the industry as a whole, and for which the ordinary revenue of the Institution—derived as this is from the subscriptions of the members—is not, and cannot be made, available.

If this should raise in the mind of anyone the question as to what are the proper and legitimate functions of the Institution, reference may be made to our Articles of Association. These cover a sufficiently wide ground to make it abundantly clear that the Council have full authority to participate in any matters affecting the gas supply industry, and to take part, if need be, in the settlement of them. Practically the only limitation the Council are under in this respect is that which may be imposed upon them by the circumstances of the hour. Whether in the administration of this Special Purposes Fund it may be possible for the subscribing bodies to be directly represented, is a matter for consideration. In any case, they are entitled to full information as to the way their money is expended.

There are many attractive subjects for investigation. But alluring roads do not always lead to fertile country; and there is true wisdom in knowing what to avoid. There are subjects for the adequate treatment of which ample funds are needed; and these must for the present be left alone. Money, however, is not everything; for much good work is often done with very scanty means. Moreover, nothing should be done to discourage individual effort, or to countenance the idea that the Institution may be called upon to do anything and everything. It is upon individual effort that the progress of the industry must always mainly depend; and this should be enlisted as much as possible into the service of such investigations as may be undertaken. In this way we may hope to get some practical results, and not such as possess merely academic interest. I need not, however, remind you that, apart from the administration of this Special Purposes Fund, there is much useful work for the Institution to do; and that whether our means be large or small, it is incumbent upon us—not only collectively, but also individually—to do all in our power to encourage and promote the application of scientific methods to our daily work, as the surest means by which real progress can be effected.

Position and Prospects of the Industry.

Turning now from matters domestic to others of more general interest, it may be remarked in the first place, that

the anxiety as to the position and prospects of the gas industry, which was so widely felt for a considerable time after the introduction of electric lighting, has gradually given way to a feeling of confidence with regard to them, which is perhaps stronger to-day than has been the case at any former period. Nor is this feeling by any means confined to ourselves, who may be supposed to know the real strength of the position. It is fully shared by the investing public, who have learned, notwithstanding fluctuations in market values, to appreciate the stability of the earning powers of gas undertakings, grounded as this is upon a continual and almost uninterrupted increase of business. During the year 1882—which was just seventy years after the starting of the gas supply industry by the granting of a Charter to the very first gas undertaking—the consumption of gas within the United Kingdom, according to the Board of Trade Returns, was in round figures 57,876 million cubic feet, and the number of consumers was 1,581,654. For the year 1905, or twenty-three years afterwards, the record was 161,408 million cubic feet of gas sold, and 5,064,075 consumers. Comparison of these figures does not as a matter of course give the actual increase during the period, because the necessary corrections cannot be made in respect of those undertakings which, having become statutory in the interval, are not included in the earlier returns. They are, however, practically confirmed by reference to individual cases. Thus, during the period referred to, the consumption in Glasgow rose from 1795 to 5821 million cubic feet, or 224 per cent.; in Birmingham, from 2692 to 6463 million cubic feet, or 140 per cent.; in Leicester, from 612 to 1835 million cubic feet, or 200 per cent.; and in the district supplied by the South Metropolitan Gas Company, from 3822 to 12,143 million cubic feet, or 217 per cent. These are but a few of many instances of the kind; though, on the other hand, there may be others which show less favourably.

The electric light has made its mark here and there in a smaller increase of gas consumption than would otherwise have been experienced; but its general effect has been to educate the public taste to a more liberal standard of illumination, which has tended greatly to the benefit of gas undertakings. It has also acted as a stimulus to the application of commercial principles to gas management, and with the happiest results. That which has been called the "take it or leave it" style (to whatever extent this may have formerly prevailed) has in a great measure disappeared; and in its place there is a general desire to assist the public in every possible way with regard to the many uses to which gas may be applied. In the development of these, the various makers of gas appliances have very laudably responded to the demand which has been fostered. It is but justice to acknowledge the value of their co-operation, which it is to be hoped may increase in effectiveness, as one of the results to be anticipated from the new organization—the Society of British Gas Industries. This has already been the means of bringing together in friendly conference on matters of common interest, representatives of various sections of the industry.

The Ironmongers' Association and Gas Cooking and Heating Appliances.

The desire which has been expressed during recent years by the Ironmongers' Association, and to which effect has already been given in many instances, that its members should be given the opportunity of sharing in the business of supplying gas cooking and heating appliances, is a satisfactory indication of a welcome change. Whatever may have been the reason, the ironmonger has, hitherto, either stood aloof while the gas manager pushed the use of his cooker or gas-fire as best he could, or else has been actively hostile. Not very long ago I was told by a local ironmonger that a certain gas-fire which I saw in his shop was not recommended by the gas company, because it was too economical in its consumption of gas. It is desirable that such misrepresentation should no longer be possible, and that an endeavour should be made to convert the best members of the ironmongery trade into useful allies.

When consumers are spread over a large area, as is so often the case, it is not always easy to keep touch with them, except by additional showrooms; and there are many ironmongers' establishments that can supply this showroom want. Moreover, if, as appearances indicate, the gas supply industry is passing (it may be slowly) through a period of transition, from which it is to emerge as the fuel-gas supply industry, one necessary change to be effected by the way is that gas-heating appliances of all kinds must not only be effective, simple, and cheap, but also easily procurable; and the proffered co-operation of the members of the Ironmongers' Association should be of material assistance in this direction.

In their adaptability to home requirements, the most approved present-day forms of gas cookers leave little to be desired; but the same can hardly be said as to their suitability for foreign markets. Here the proverbial indifference of the British manufacturer to foreign requirements asserts itself; and British gas companies having works abroad are obliged to depend largely on foreign manufacturers for their supplies. With regard to heating appliances other than cookers, the last word has certainly not been said; and how to secure the best effect with the smallest consumption of gas requires to be most carefully studied. That the subject is a difficult one, must be admitted; but that is the more reason why it should be attacked with all the resources at the command of the Institution.

The Council have therefore, as I believe, done most wisely in referring this very important subject to a carefully selected Sub-Committee for investigation, and in securing for it the invaluable co-operation of such eminent scientists and specialists in this particular subject as Professor Smithells, and Drs. Cohen and Bone, of Leeds University. That they do not under-rate the task before them is apparent from a letter addressed to me by Professor Smithells in which he says: "I have had occasion to see something of the testing of gas-stoves and of attempts to determine their thermal value. All that I have seen has convinced me of the enormous difficulty of the subject; but I admit that this should be no barrier to an investigation, but rather the reverse so far as this University is concerned, and I hope that after conference we may be able to decide upon some promising plan of campaign." That, it appears to me, is quite the right spirit in which to approach a subject of this kind; and we may very fairly regard it as of most hopeful augury.

In the meantime, there are one or two practical considerations which naturally occur in connection with this subject, and which it is desirable should not be lost sight of. Our insular prejudices have invested the domestic hearth with something approaching to inviolability; and we gather round a good coal fire on a cold winter's night with a keen sense of enjoyment, and are apt to think condescendingly of the poor foreigner who is without experience of it, or of its occasional concomitant, a smoky chimney. It is true, also, that this time-honoured institution is considered by sanitary authorities as almost necessary for ventilating purposes, notwithstanding the cutting draught which it but too often promotes. Concentration is moreover in reality as uneconomical and ineffective for heating as it is found to be for lighting. Light is distributed most equally, and with the greatest economy, from a number of points of moderate intensity; and gas should lend itself to a similar mode of treatment when it is required for heating purposes.

This at once raises the question whether, under existing conditions, there is likely to be any general displacement of coal by gas-fires, or whether another class of appliances—namely, the flueless gas-stove—is not destined to play a rather conspicuous part in the gas-heating arrangements of the future. This stove is capable of being used in almost any position, and is already widely employed. It was, however, as you are aware, excluded from the recent examination by the Smoke Abatement Exhibition Committee, and is frowned upon by the medical profession generally; although Dr. Rideal, for one, has added to his already conspicuous services to the gas industry by his unprejudiced attitude with regard to it. Not many years ago a very popular professor who shall be nameless expressed the opinion that the gas company who fixed a flueless stove should be prosecuted. This is very like saddling the wrong horse. It may be remembered that a manufacturer was recently prosecuted under the Factory Act for permitting the air of a room in which a number of his employees worked to become charged with an excess of carbonic acid. In order to warm the room, all the available gas-burners had been lighted, and the windows and other means of ventilation closed. Surely it is not the supplier or the fixer of the gas-burners who ought in this case to have been prosecuted.

Efficient ventilation, it seems to me, is the proper care, not only of the architect or builder of a house, but also of the

occupier of it, and no more devolves upon the seller of gas than it does upon the supplier of an oil-stove used for heating purposes, the products of combustion from which are discharged into the air of a room in just the same way as are the products of combustion from a flueless gas-stove. Incidentally, however, we are a good deal (not to say vitally) concerned in this question of ventilation, especially as applied to dwelling houses; for upon a satisfactory solution of it must greatly depend the general adoption of gas for heating purposes. It is very desirable, therefore, that the matter should be carefully inquired into, and an endeavour made to improve upon the present casual method of ventilating by means of badly-fitting doors and windows and gaping flues. It may, indeed, be advisable for the Council to offer, so far as funds will admit, suitable prizes for the best work done in connection with this all-important subject.

Recent Gas Legislation and its Influence upon Carbonizing Results.

Any reference, however brief, to the highly important and momentous gas legislation of the last few years—by which the industry has been freed from restrictions that were a barrier to its progress—would, I am convinced, be unacceptable to this audience unless accompanied by an acknowledgment (however inadequate) of the splendid services rendered by Sir George Livesey by his initiation of this legislation, and of the indomitable pluck, perseverance, and tactical skill with which he fought the fight to a finish. But for him, it is impossible to say how much longer the industry would have had to labour under the double disadvantage of compulsory lime purification and high illuminating power; but for him our progress must, consequently, have been halting and unsatisfactory. It would be out of place for me to say this on my own account; but you who know how to value and how to appreciate the great work that has been done, will, unless I am greatly mistaken, wish me to express from this place some degree at any rate of that which is in your minds with regard to it. It matters not that the battle fought was that of the London Gas Companies; the victory remains with the gas industry as a whole. A momentous step forward has been accomplished, and the gas manager may henceforth devote his time and energies to more profitable use than watching for fluctuations of a few grains of sulphur compounds or for rushlight changes of candle power. During what may be properly called the struggle for greater freedom, the evident sympathy of Parliament with the object of the movement clearly showed that the idea of a supply of cheap fuel gas has taken firm hold on the public mind, and that so far as the Legislature is concerned but little difficulty need be apprehended as to the reception of any well-considered scheme in furtherance of it, whenever the time may be ripe for a continuance of the movement.

In a limited sense this anticipation may be said to have been realized by the enactment of 13 candles illuminating power in several instances, in spite of the official halt which has been called at 14 candles. There can be no such thing as finality in this matter, so long as it may appear that advantage must result from the withdrawal of illuminating power. At the same time it is not undesirable to proceed by steps, especially as the question of how best to bring our methods of manufacture into line with the altered requirements is one that has not yet been completely or satisfactorily determined. Already, however, throughout the country there are many (who may be called advanced carbonizers) who are witnesses to the fact that there is more to be got out of a ton of coal than is found to be possible in the generality of works. Those who are in the habit of saying, "I am not a believer in high makes," can scarcely be counted as belonging to this class. But the leaven is slowly making its influence felt; and the sooner it leavens the whole body the better it will be for the gas industry generally. This is a theme on which I have more than once had occasion to express myself in a similar sense; and the importance of it impresses me more and more as time goes on. It used to be said that a comparatively low yield of tar indicated up-to-datedness in carbonizing, because what was lost in tar was more than gained in gas. If I ever shared that belief, it was discarded by me long ago, for the simple reason that personal experience exposed to me its fallacy. It can, I believe, be proved up to the hilt if necessary, that, speaking generally, so far from a comparatively high yield of residuals being inconsistent with a high yield of gas, the two go naturally together, and it is only by unsuitable carbonizing arrangements that they are divorced. One is impelled to this conclusion by observing that in neighbouring works using practically the same coal, results most discordant are obtained. If I said also that a higher yield of gas than is usually obtained does not necessarily affect illuminating power, the statement would not be far from the truth, and should indicate the existence of a further reserve to be drawn upon for the production of low-grade gas by the application of suitable methods of manufacture.

Carbonizing Arrangements—Feld's Process.

Innovations in carbonizing plant have been much under discussion lately, and although as yet no absolutely definite conclusions have been arrived at with regard to them, their introduction has already served the very useful purpose of directing attention to what is really required of an ideal carbonizing arrangement. In the old days, when the supremacy of the horizontal retort was still unchallenged, much was left to chance in the obtaining of results; and even down to quite a recent period, the highest effort in this direction took the form of elaborate and more or less expensive experimental works, modelled after existing retort-house arrangements, upon the working results of which they were intended to serve as a check. While agreeing fully that such an apparatus may serve some useful purposes, the purpose I have mentioned does not appear to me to be one of them. It is not by copying ourselves, so to speak, that real improvement is to be effected; for probably there is scarcely a retort-house in the kingdom that might not in some feature or other be improved. What is wanted for the purpose of checking working results is information as to what the coal in use is capable of producing under the most favourable conditions; and this can generally be obtained by experimenting on a very modest scale. Such information is sure to be of the greatest value, if kept steadily in view, as a standard to be worked up to as nearly as may be.

The almost absolute evenness with which it is possible to charge inclined retorts fulfils one very essential condition of good carbonizing. But the discussions on vertical retorts have advanced the matter further, since they show that we ought no longer to be content with any system which does not insure obtaining from coal the whole of its gaseous products without injury to them from overheating, and consequently without the occurrence of stopped pipes or naphthalene deposits. Whatever may result from the efforts which are now being directed to the establishment of vertical retorts—and we all hope it will be success—it is at any rate satisfactory to have a clear idea of the points to be aimed at in designing a carbonizing plant. Those who have at some time or other looked through the work on "Gas Lighting" which forms the third volume of "Chemical Technology" may remember the opinion is there expressed [p. 187] that carbonizing temperature may be and often is raised beyond economical limits; and also that the obstructions referred to [stopped pipes and naphthalene deposits] are spoken of as a kind of danger signal, "as in the nature of warnings that no prudent gas manager can afford to despise." This was written some years ago, but appears to be equally true to-day. It follows from it that any such means as improved condensation or washing for the avoidance of naphthalene deposits are to be regarded as expedients rather than as permanent remedies, since the relief they may afford—acceptable though it be—is not to be compared with the economical advantage that should be derived from tracing the mischief to its source. It is not too much to say that those who show "big makes" with correspondingly high yields of tar and ammoniacal liquor (for this is essential) are, in reality, doing pioneer work of the highest possible value in this connection, and the more their numbers increase the less will be heard of stopped pipes and naphthalene deposits.

An alternative method by which to avoid the serious difficulty and loss caused by these obstructions—if only it could be effectively applied—is to rapidly cool the gas immediately upon its leaving the retorts. This appears to prevent the change which the gas undergoes when it issues from the retorts under the influence of unduly high temperature, and which is now believed to be responsible for the production of naphthalene as well as of carbon deposits. Many of us have, at some time or other, experimented with water-cooled ascension pipes, without, however, fully realizing the significance of the effect produced by the cooling process. Had it been otherwise, much fruitless labour in other directions might have been avoided, and perhaps also the carbonization

of coal might ere now have been lifted up to a higher level as regards results. Now, however, it is proposed to effect practically the same object by keeping the gas at the temperature at which it leaves the retorts, until it has been subjected to a washing process. This is stated to have the further advantage of separating the tar free from water in the forms of "heavy" and "light," and thus effecting at first hand, so to speak, an important distilling operation, with an increase in the value of the residuals. All water is subsequently separated at a sufficiently high temperature to cause the ammonia to pass forward with the gas, this being afterwards eliminated as sulphate of ammonia.

It is to be hoped that much more may shortly be heard of a process which, by means of a series of ingeniously designed washers, aims at but little short of the realization of what has long been a dream of the gas manager—that is to say, complete purification in closed vessels. For the present, however, the process is interesting chiefly as indicating a possible means of escape from the evils resulting from what may be termed "forced" carbonization; but it ought to prove very valuable in this connection if it be found to assist in securing those higher yields of which I have spoken.

Recovery Coke-Ovens and Residuals.

This process of Feld's, to which I have thus very briefly alluded, has been devised for the purpose of dealing with coke-oven gases, and is so employed. It is understood, however, that its application to ordinary gas-works is proceeding; and if this should prove successful, the recovery coke-oven industry will have done something for the gas industry by way of compensation for the lower prices of residuals for which it is mainly answerable, and which, while but a natural consequence and indication of industrial progress, make it necessary for us to encourage new uses for our products, particularly such as may furnish a market for them near at hand.

It is fitting, therefore, that the application of tar for road-making should be one of the subjects for discussion at this meeting; nor need there be any lamentation over this implied degradation of a substance which has yielded in the past such great triumphs to Science, and established more than one world-wide reputation. That gas undertakings have on the whole derived great benefit from the tar-colour industry is unquestionable, since without the demand for tar or benzol which has been thus created, there is no knowing to what depths prices might have fallen. But, marvellous as have been its developments, and greatly as these have excited both admiration and imagination, it may be doubted whether they are calculated to serve the interests of humanity to an extent commensurate with the importance which this industry has now assumed. I am very far indeed from wishing to under-estimate the value of colour; for without it life would be deprived of much of its enjoyment. But, on the other hand, a good road is a paramount necessity. There is, however, no need to make choice between the two purposes, since there is material enough in the world for both. The supply of it must, in fact, continue to increase as a result of the gradual displacement that is going on of the old wasteful method of coking coal—how gradual may be inferred from the fact that in America alone, of about 36 million tons of metallurgical coke made in 1905, only about 10¾ per cent. was the product of recovery ovens. Very much greater progress than this, however, has been made on the Continent, where indeed the system originated, and where recovery of residuals is now the rule. Even in England it is fast ceasing to be the exception; the production of sulphate of ammonia from this source having more than doubled during the last five years.

When I occupied this chair in 1881, I referred to this system (then in its very infancy) as one that might offer a clue to the direction in which improvement in carbonizing should be sought, chiefly as a means for the economizing of labour. In 1896, being then impressed by the probable effect of the great extension of the system upon our market for residuals, I was led to inquire, in the course of my paper entitled "Notes on Residuals," in what light it ought to be regarded. "Should it be approached as a possibly ally, keeping in view its advantages in the saving of labour, or must its advantages be watched at a distance, as those of, to all outward appearances, an intractable competitor?" Much has happened since then to confirm the views I then ventured to express as to its probable utility as an ally when circumstances happen to be favourable. In America at the present time very large quantities of coke-oven gas are being daily distributed for heating, lighting, and motive power—so large, in fact, as to suggest this as the chief use to which the system is there applied. We hope to be favoured at this meeting with an account of what is being done there, and also of what has already been attempted in this country in the same direction.

It may be noted, in passing, that in the event of the establishment as a commercial product of the substance which has recently excited no little interest and curiosity under the name of "Coalite" (which it is not difficult to recognize as coal carbonized at a low temperature), another competitor in the residual market will have been created. It is difficult to believe that it can prove remunerative to employ expensive plant for the extraction of a portion only of the volatile products; but would not the success of such a process furnish an additional incentive to an inquiry into our methods of carbonizing from the coke-makers' no less than from the gas-makers' point of view? It would be something gained if, without injury to results in other directions, the market value of the coke we are compelled to produce could be permanently enhanced.

Conditions of Successful Carbonizing.

In one respect, the recovery coke-oven fulfils, to a great extent, the condition which experience has now shown to be essential to successful carbonizing—the gas being taken from the oven in bulk without exposure to excessive radiant heat. With vertical retorts, and also with Mr. G. R. Love's retorts set at an angle of 45°, limitation of space between the charge of coal and the top or outlet of the retort is found to be advantageous. This does not imply condemnation of the horizontal retort, which is placed at a disadvantage by excessive heating. As a matter of course, the object of every system of carbonizing is, or ought to be, to obtain the utmost all-round value from coal at the lowest possible cost. Whether this is attained by any of the systems now under trial, and whether by one or other of these the production of really cheap heating gas will be brought any nearer, are questions that will probably be answered in one way or the other before very long. In the meantime, it is satisfactory to know that this great question of carbonizing is at length receiving the attention that is its due. It is much to be hoped that the "dry bones" which were stirred to life by M. Coze's bold experiment at Rheims, will not again return to quiescence until something like finality on the subject has been reached. The probability is that the problem which is now being so vigorously attacked, will be found susceptible of more than one solution, and that complete success in carbonizing is not dependent upon any single system. The subject is of such commanding and paramount importance that it is greatly to be hoped that every member of the Institution will, so far as may be needed, heartily co-operate with the Sub-Committee who have, at the instance of the Council, kindly undertaken the investigation of it.

Need for Economical Methods of Manufacture—Co-Partnership.

Now and then comes a reminder of the absolute necessity for practising the most economical methods of manufacture, if we are to run successfully in the race that is set before us. This reminder may take the form of an application for improved conditions of labour, involving increase of cost, or of a rise in the prices of gas-making materials. With regard to the former, there is good reason for saying that the shorter hours of labour that are now the rule, coupled as these have been in some cases with increased pay, have practically absorbed the savings derived from the adoption of mechanical appliances. This was actually the case in Birmingham, as I was able to show a few years ago. Labour troubles have, however, been less frequent of late years; and it is to be hoped that recent legislation will not have the effect of disturbing the good feeling at present existing between gas-workers and their employers. But whatever may befall, there is in our midst a remedy for disaffection, the success of which has been wholly unequivocal, which unites in the most practical manner the interests of employers and employed—converting antagonism into friendship, and mistrust into confidence and goodwill.

I refer, as may be supposed, to the system of co-partnership established by Sir George Livesey, which has stood the test of time, and continues to give increasing satisfaction to all concerned. It has been my privilege to be associated with the working of this system for the last five

years; and I can bear testimony to the goodwill and contentment that exist under its influence. It would, of course, be strange if, among any considerable body of men, there were not a few, who, however advantageous their surroundings, find something to make a grievance of. That is, however, very much a matter of temperament. Others there may be who will not become conscientious workers. These may be likened to the drones that are turned out of the hive by the working bees. For co-partnership tolerates no one who will not work for others as well as for himself; who will not strive for the common weal. Moreover, the very essence of the system is the opportunity which it affords for making a provision for old age or a "rainy day;" and for those who will not be thrifty, there is no place in it. Gas-workers as a rule have but very slight acquaintance with the inside of a savings bank; and to promote habits of thrift among them is surely doing good service to the State. Much is said now-a-days on the subject of old-age pensions; and these, if wisely administered, cannot fail to be of great benefit to such as may have had no opportunity of providing for their declining years. But how much better than these must be a system which gives them such opportunity, and leads them on to practical independence. "I have," a co-partner was heard to say, "£350 of my company's stock, and had the co-partnership scheme only been started a few years earlier than it was, I should now have had enough to retire upon."

Here, then, is a system which does for the working classes that which industrial enterprise and opportunity for lucrative investment of small savings has already done for the middle classes. It lifts up the workman from the position of living from hand to mouth, to that of property owner—asking of him in return no more than observance of the injunction, "Whatsoever thy hand findeth to do, do it with thy might." A more ideal system for reconciling the too-often conflicting interests of capital and labour, it is difficult to imagine; and the wonder of wonders is that it has not been more extensively followed. Whatever may be the real reason for this as regards our own industry, lack of sympathy or encouragement on the part of those who are amongst the most deeply concerned—namely, gas shareholders—cannot be urged; for their approval of the system has been invariably manifested whenever the subject has been under discussion. It will do no harm to remind those who have control of gas undertakings in whatever capacity that there is no bond so sure as that of self-interest; and that the goodwill and hearty co-operation of all ranks of employees is essential to the success of any industrial enterprise. It has been proved that these may be secured by allotting to the employees a proportion of profits earned; and if at the same time the worker is led to become thrifty and self-respecting, then surely it may be claimed that one of the most pressing of the social problems of our time has been satisfactorily solved. It is a solution that should commend itself to all true friends of the wage-earner—it being Socialism founded upon the assumption of individual ownership. It is essentially what one of our Colonial Premiers would call "Safe Socialism." As a matter of course, the permanence of any institution of the kind must depend upon its utility; and the utility of this particular institution depends upon the employees themselves. It will continue to flourish so long as they show their appreciation of it; but if ever they should cease to do so (which I for one cannot conceive to be at all likely), it will not, in the very nature of things, survive.

Engineering Trades Agreement.

A further satisfactory indication of the improved relations between employers and employed is afforded by the new engineering trades agreement, recently arrived at by the Engineering Employers' Federation and the Engineering Trade Unions, as to which (in the opinion of "The Times") "it is doubtful if, in all our industrial affairs, a more comprehensive and fair-minded document was ever evolved. Its principle is justice, and its essence is what, in Trade Union phraseology, is called 'mutuality.'" The preamble of this remarkable document runs as follows: "The representatives of the Engineering Employers' Federation on the one hand, and of the Engineering Trade Unions on the other hand, being met in joint conference, and being convinced that the interests of each will be best served and the rights of each best maintained by a mutual agreement, hereby decide to adopt measures to avoid friction and stoppage of work." This means, practically, the abolition of what is termed the militant element, with provision for the settlement of trade disputes by conference between employers and employed. It is greatly to be hoped that this agreement will be loyally observed both in spirit and in letter, and that so excellent an example will be generally followed. Strikes are disastrous alike to victors and to vanquished.

Coal Prices.

The upward tendency of the coal market has recently been a source of considerable anxiety; and although the keen edge of this has now worn off, the immediate outlook is by no means reassuring. Having regard to the ups-and-downs of trade, it would be less than reasonable to expect the maintenance of anything like a dead-level of prices for coal extending over a series of years; but in their readiness to inflict upon gas undertakings the full measure of any temporary inflation of prices, colliery owners are too apt to ignore the fact that these are among their most regular and certain customers, but for whom it would be next to impossible for some of the collieries to be kept working during periods of depression. It is urged as a reason for this course that the comparatively low prices which are submitted to in such times have to be made up by much higher ones when opportunity favours the colliery owners. But it ought not to be impossible to arrange a sliding-scale of prices for a term of years that would be equitable to all concerned. It is said that in America coal properties are held in the interests of large gas undertakings by subsidiary companies; and there are gas coal pits in this country probably that could be similarly worked. The suggestion has been made that the price of coal should be regulated by Government, on the ground, apparently, that Parliament regulates the price of gas. The proposition might be a feasible one, were our mineral resources nationalized. But under existing conditions—which can scarcely now be altered to any extent—there is no analogy between coal-getting and gas supply; nor can it be desirable that anything should be done that might have the effect of diverting the flow of capital from this industry.

Objection is made to the remission of the coal tax, on the ground that this has stimulated exports; but with regard to this the finding may be recalled of the Royal Commission on "Coal Supplies" in 1904. This was that "the maintenance of a large coal export trade is of supreme importance to the country and essential to the prosperity of the coal-producing districts. The larger output thus rendered possible, enables collieries to be worked regularly and to the fullest capacity; and the general and fixed charges being spread over a larger tonnage, the average cost of working, and consequently the selling price to the British consumer, can be kept lower than would be the case if the collieries were worked for home consumption only."

Supposing the Commissioners to have been wrong in their conclusion, and that the export trade, for a portion of which British gas enterprise abroad is responsible, does not help to lessen the cost of coal-getting, there would still remain the very serious question as to what would be the justification for curtailment of so important an industry, and the reduction of employment which this must inevitably involve. It is scarcely to be found in the amount of the available supply of coal, which, in the report of the Royal Commission, is stated to be in excess of what it was more than thirty years ago, notwithstanding the enormous quantity that has since that time been raised. Last year alone the total output reached 251 million tons, which was an increase over that of the preceding year of nearly 15 million tons. It speaks well for the coal resources of the country, and also for the organization of the coal-mining industry, that this almost phenomenal increase—corresponding as it does to the total yearly requirements for gas-making purposes—was met with but little, if any, industrial disturbance. For the benefit, moreover, of those coal-owners who are apt to plead, in extenuation of their own shortcomings, the irregular working of their men, it may be pointed out that, whereas this increase represents 6·33 per cent. of the total output, the number of persons employed was only increased by 2·79 per cent. It follows from this that not fewer but more hours per man are now being worked than formerly—an indication of improvement in habit that it would be well to bear in mind. It is gratifying also to be able to record in this connection a gradual increase of temperance among all classes of our population, as indicated by the figures of what Dr. Dawson Burns calls our "drink bill."

The Effect of Coal Booms.

Coal booms undoubtedly cause much mischief by dislocating trade. They operate as a check to industrial development in almost every direction; and in these days of severe competition, it is a very serious matter for us to have to contemplate a substantial increase in the price of gas. It is, however, some consolation that one of the permanent effects of a boom is usually the development of new coal fields. For example, it was recently stated that the introduction of additional capital in the Lothians is likely to treble the output in that coal field. Here let me express the great pleasure which all must feel at the recent discoveries of coal and iron ore in the counties of Antrim and Londonderry, and our earnest hope that these may be productive of increased prosperity for this country. To a certain extent, however, the ill-effects of coal booms are also permanent, because costs once raised are not easily brought down again. There is likewise reason to believe that the gradual exhaustion of the most easily workable seams is causing a permanent increase in the cost of coal getting.

Water Gas as an Alternative.

It might be expected that at such a juncture as the present carburetted water gas would come to the rescue; and so it probably will, to some extent. As an economical process, however, it can scarcely be said to have increased in favour, owing chiefly to the uncertainty as to oil supplies; although there can be no reason why the use of water gas, in some form or other, should not prove a valuable auxiliary if the reduction of calorific value which it occasions is accompanied by a corresponding reduction in cost.

Gas as a Lighting Medium.

Under existing conditions, the position of gas as a lighting medium is an assured one, although this is not always recognized to the extent we may desire. For domestic purposes preference is sometimes given to electricity, regardless of cost and of its inferiority to incandescent gas in quality of light. But with the choice that may be exercised by private consumers, there is no possible ground of quarrel, since the competition, so far as these are concerned, is, or should be, a fair and open one. With regard, however, to public lighting, the case is different. Here, although the superiority of incandescent gas is patent to everyone, it not unfrequently happens that electricity is adopted at considerable additional cost to ratepayers simply because the local authority possess electricity works, and desire to support their own establishment. There are, it is true, honourable exceptions to this exhibition of partiality, which it is a great pleasure to acknowledge. One such exception (and a very notable one) is that of Liverpool, where the Corporation own the electricity works, and where, notwithstanding, street lighting by electricity makes comparatively little headway. Another is Ipswich, where gas was recently decided upon for street lighting in competition with the Corporation supply of electricity. Other instances of the kind no doubt there are.

Again, when the supply of both gas and electricity is in the hands of the local authority, or when the local authority own neither the one nor the other, electricity has but little chance. Bradford may be cited as an example of the one type of cases, and the City of London of the other, in which the decision, based solely upon merits, has been favourable to gas. But in how many other instances are not local authorities owning electricity works flagrantly partial to the detriment of their constituents, who have to pay a great deal more for an inefficient system than the cost of a thoroughly efficient one? We know, for instance, why the lighting of Oxford Street is by electricity and not by gas; and the present powers that be in the Metropolis may find other similar abuses to correct. Elsewhere examples abound of electric street lighting inflicted at enormous cost upon the long-suffering ratepayers. For twenty-one miles of such lighting, most of which may be very fairly described as "darkness made visible," the ratepayers of Bexhill-on-Sea have the privilege of paying £2950 per annum, or at the rate of about £140 per mile; it being estimated that fully double the amount of light could be given by incandescent gas at one-half the cost. In the neighbouring more important watering place of Hastings, where the cost of incandescent gas lighting is between £70 and £80 per mile, the cost of arc electric lighting is about ten times that amount. Again, at Bristol the cost of lighting 25 miles of streets by electricity is stated to be at the rate of about £461 per mile; whereas the cost of lighting 335 miles of streets by gas is about £75 per mile. An offer by the Gas Company to light the whole of the streets with incandescent gas at an actual reduction of 6s. per lamp on the rate that was being paid for ordinary gas lighting, does not appear to have commended itself to the Bristol electrically-ridden "City Fathers."

Cheltenham furnishes, if possible, a still more glaring example of waste of public money on electric street lighting. Here the cost to the ratepayers for 65 miles of street lighting has increased in eleven years from £4574 to £12,086 per annum. An analysis of the latter figure shows that whereas 50 miles of incandescent gas lighting cost £2909, only 15 miles of electric lighting cost £9177—the cost per mile being £58 and £612 respectively. Small wonder that complaint is made that the lighting rate, which now equals about 11d. in the pound, is nearly 6d. in the pound more than it was ten years ago, and now exceeds by £2000 what is paid for education in the elementary schools of the town, and by £500 what it costs for repairing and cleaning the roads and footpaths. At Croydon, again, the authorities have placed themselves in the false position of partizanship in regard to this matter. Here the cost of electric arc lighting is £497 5s. per mile per annum, against £55 8s. for incandescent gas lighting; while a joint offer made some time ago by the Croydon and South Suburban Companies to light with incandescent gas free for six months, for comparison with electric arc lighting, a selected section of the town in such a manner as would represent an annual saving in cost to the Corporation on the entire lighting of the town equal to a rate of 1d. in the pound was persistently shelved.

There is, however, no need to continue the recital of cases that have become so numerous as to be a grave reflection upon municipal management, albeit relieved by the action of authorities such as those of the cities of London and Westminster, and the London County Council, whose selection of incandescent gas lighting for some of the most important thoroughfares of the Metropolis is ample proof of its present superiority over arc electric lighting.

Taxation without Representation.

The very great waste of public money which is indicated by the figures I have quoted, and of which the various gas undertakings have to bear their share in the form of increased rating, accentuates the hardship which the present system of local taxation inflicts upon all joint-stock companies. So far as these are concerned, this system is one of taxation without representation. As Mr. Frank Bush very clearly pointed out in his recent admirable letter to the Board of Trade, these companies "pay a very large and increasing portion of the rates with no control whatever over their expenditure, and with no voice or vote in the election" of councillors or members of Boards of Guardians. This is a highly unsatisfactory position which calls loudly for a remedy, as does also the method of assessment against which the South Metropolitan Company recently appealed without success. Gas consumers can hardly be aware of the extent to which they contribute indirectly to the rates through their gas accounts, in addition to their direct assessment. This indirect contribution may amount to anything up to 3d., and even 4d., per 1000 cubic feet of gas sold; and it forms an obstacle to the extended use of gas which in the general interest it is incumbent upon us to overcome as far as practicable. The Institution will, I feel sure, desire to lend a helping hand in any endeavour that may be made to simplify and amend the law of rating with a view to placing local taxation on what we conceive would be a more equitable basis, and securing to all its contributors adequate representation.

Position of Gas for Purposes other than Lighting.

It is a fortunate circumstance that illuminating power (as such) no longer counts for lighting purposes except to a small and diminishing extent, since on entering the arena of competition with other forms of fuel, reduction of candle power is the most obvious direction in which to effect that economy which—always desirable—is thus made indispensable. This reduction has not, however, proceeded very far as yet, although far enough to show that it is a road along which progress is not very easy, when burdened with *impedimenta* in the shape of calorific value. Some have already pursued it to a considerable distance, but none probably to its full extent; and there is a possibility (to which I have already referred) of its leading to new carbonizing methods. These

may involve a radical departure from existing systems of retort-house machinery, the advantage of which is to be recognized in its humanizing influence as much as in the saving it may be the means of effecting in the cost of manufacture. It is noticeable that a man who, having been accustomed to manual labour, finds himself in charge of a machine, at once rises in his own estimation and becomes more careful both of himself and of his surroundings. There are limitations, however, to the employment of machinery which all would do well to observe. The man with a barrow or tipping truck ought not to be lightly put aside.

It is still possible to provide for extension of business at a lessened cost per million cubic feet of gas sold, except where the extension takes the form mainly of slot-meter consumption. But of perhaps greater importance in its economical effect is the growth of day and summer consumption. This subject was recently dealt with very ably and fully by Mr. Herbert Lees in a paper that was read by him before the North of England Gas Managers' Association. A wonderful change has been brought about during the last few years mainly by the gas-engine and cooking stove—the proportion between the smallest and greatest weekly output having in some cases fallen to 1 to 3, whereas formerly 1 to 4½ or even 5 was the rule rather than the exception. These avenues to savings are not yet closed, so that capital charges may be expected to continue to show diminution with increase of business although perhaps in a lessening degree. To the extent, however, to which this possibility of saving still exists, it is something to the good, of which it behoves us to make the most.

Companies and Local Authorities Compared as to Capital Indebtedness.

In connection with this subject of capital expenditure, let me again call attention (I remember doing so some years ago) to the increasing difference between the net indebtedness of the local authorities on gas-works account, and the capital outlay of gas companies. The figures based on the Board of Trade returns for 1905, are now £471 and £840 respectively per million cubic feet sold; the great difference exhibited by them being no doubt largely due to stock conversion by many of the companies. Seeing, however, that in nearly all cases local authorities have had to pay for goodwill, in the shape of large premiums on capital invested, the comparison holds good. I have no desire to disturb the harmony of this gathering by saying anything upon the somewhat vexed question of municipal trading as applied to gas undertakings; but it must be apparent to all that, in their treatment of capital charges, the local authorities have shown themselves to be wise in their generation, and that their position in this respect in years to come is likely to be a much stronger one than that of companies.

Application of Commercial Methods Desirable.

Let me bring this rather lengthy address to a close by the somewhat trite observation that the very great importance attaching to additional consumption as a means of reducing cost emphasizes the desirability of employing commercial methods for acquiring new business. These are by no means confined to advertisement, which has become almost a fine art, or what is designated as "push." They may be applied in a variety of ways, as to which I will not attempt to anticipate the papers on the subject which are to follow. But take as an illustration our obligation to furnish a supply of gas when called upon—subject to certain prescribed conditions. This may involve our having to give a stand-by supply to the user of a suction-gas producer. It has been suggested that relief from this obligation should be sought from Parliament (which has already in one instance refused it) on the ground that electric light suppliers are under no such obligation, and also that in certain cases the required service may mean a loss to the gas undertaking. To the extent of such loss, the grievance is a real one; and it would call for a remedy, were it not for the advantage that should ultimately accrue from having your gas installed on premises ready for use whenever the customer may require it. In these days of competition, no reasonable opportunity for introducing gas should be missed—it being fairly certain that such introduction must sooner or later lead to its being used. That at all events appears to me to express the true commercial spirit which it is desirable to encourage in the conduct of gas undertakings; and personal experience in this particular direction has convinced me of its wisdom. May I also say, with regard to the recently suggested "boycott" of manufacturers who may find it to their advantage to use in their workshops suction producers or electricity, that it can hardly be to our interest that these should be handicapped in any way, and also that we ought not to deny to others that freedom which we desire for ourselves.

We do most certainly desire to secure for the gas industry the greatest amount of freedom that may be compatible with the fulfilment of our obligations. We look for increasing recognition of the leading part which this industry must of necessity take in the coming substitution of gaseous for solid fuel; and we shall not look in vain if only we continue to be true to ourselves, and to the destiny that has yet to be accomplished.

NOTES FROM WESTMINSTER.

Work was taken up with a little more earnestness by Parliamentary Committees last week; but there are only two or three questions calling for notice here.

All Over a Site. If gas-works were really as bad as they have been painted lately in the Committee rooms and in the House of Commons, it would become a question whether, even the great public service that gas supply renders ought not to be surrendered to get rid of such pests. It has been alleged that gas-works are nuisances, and mischievous, damage-producing establishments. The House of Lords, the House of Commons, and the man in the street are unanimous in saying that where gas-works are worked under modern conditions and by the exercise of ordinary care, they are not the nuisance producers that they are said to be when people, for personal reasons, do not want them near their property. There has been a great deal of noise and foolishness displayed over the Worthing Gas Company's Bill. Both noise and foolishness commenced in the Commons Committee room, were carried into the House of Commons, and then transferred to the House of Lords, where they have now been effectually silenced; and the Company have issued from it all with their Bill intact, and the site that they desired as a prospective possession. It was only the gas-works site that was assailed; all the rest of the Bill did not provoke anyone's hostility. The site is situated at Goring; and the landowners did not want the Company's works there. It was suggested that the Company should betake themselves to other sites eastwards of Worthing. But not a single piece of ground could be found there that offered the same railway facilities or the same good foundations for works as the Goring site. All this was proved in the Commons; and the whole battle was fought over again before Earl Donoughmore's Committee for three days last week. Really most of the gas engineers practising in the Committee rooms appeared willing to support the Worthing Company, though the opposition had managed to get hold of two to lend them a helping hand. Sir George Livesey, Mr. Corbet Woodall, Mr. Charles Hunt, Mr. Joseph Cash, Mr. Charles Morgan, Engineer-in-Chief of the L.B. & S.C.R., the Gas Company's own Engineer and Manager (Mr. W. A. Walker) all defended the Company's choice; and the Chairman of the Company (Mr. H. Gardner) and a host of local witnesses also went into the chair in support. Mr. E. H. Stevenson and Mr. H. E. Jones were the Engineers examined on behalf of the opponents. The long and the short of the matter is that the landowners of Goring did not want the Company's works; and they failed completely to prove that damage would be occasioned, and that their private feelings in the matter ought in any way to receive greater consideration than the public interests. The opponents, however, were consistent to the end. They wanted the Committee to insert a special compensation clause; but the Chairman made it quite clear to them that they had been trying to satisfy the Committee for three days that the damage would fall on the innocent landowners, but their Lordships had decided against them. The landowners now have to console themselves for the loss of money involved with the memories of the wasteful fight in which they have been engaged.

London's Electricity. On Wednesday, the Hybrid Committee of the House of Commons (of which Mr. D. A. Thomas is the Chairman), to whom have been remitted the duty of considering the much modified Electricity Bill of the London County Council, set to work. What they have to deal with is something that is light in comparison with the measures in the same line that have occupied Committees of the House during the past two sessions. It is significant that while the Bill as introduced this session by the Progressives brought up an opposition 86 strong, the curtailed Bill of the Moderates has reduced that opposition to twenty, seventeen being local authorities; and most of these are merely in opposition with the view of trying to get their districts excluded from the Bill. But there is little chance of this honeycombing process being allowed. The opponents are also averse to the "conditions affecting supply" clause, known as the "Kitson" clause, which refers to the supply

of electricity to railways and the Council's own premises. Somehow we do not think the Moderates would care much if the whole scheme was knocked on the head; for the Hon. H. W. Peel, the Chairman of the County Council Parliamentary Committee, seemed in his evidence to quite composedly contemplate the eventuality of the Council not being able to make terms with any one to take over the undertaking in the prescribed period of twelve months, and the whole powers lapsing in consequence. Of course, his demeanour may have been due to the knowledge that there are people who will be quite willing to take up the scheme, however near it may approach to a wild-goose chase. There have been no actual negotiations yet for the transfer of the scheme; but there have been discussions with people—among them some of the promoters of the Administrative Company, who withdrew their Bill recently, and no unwillingness has been shown to the taking over of the powers. Nor does Mr. Peel put the scheme on any higher level than a convenient plan for having a form of control over the undertakers during the next half century. He is of opinion that the scheme will give greater competitive powers than the original Bill. There is not much to be said about the proceedings up to the point at which they have arrived; but the Committee have intimated that the Council, in the modified Bill, have not met the mandatory instruction received from the House of Commons. It has been suggested to the promoters that some form of lease should be included in the Bill which would be something of a guide as to what the conditions are on which the Council are prepared to transfer the powers of the Act. As put by Mr. Freeman, K.C., the Council are in a difficult and delicate position in regard to this matter. They want to have a free hand, and they ought to have it, in dealing with their lessees; and they also want to be respectful to Parliament. But they are to do something more than has been yet done in enlightening Parliament as to their intentions. The Dartford and Brentford Gas Companies are in opposition; and the question of electrolysis is being raised.

Metropolitan Water Charges. The Joint Committee on the Bill of the Metropolitan Water Board have completed their labours; the latter days' sittings having been devoted (the preamble of the Bill having been declared proved before the last reference was made to the matter) to the discussion of clauses. All questions of detail, apart from the principles involved in the Board's proposals, were left to be threshed out on clauses. There were, however, a hundred-and-one points to be dealt with; and something like an attempt has been made to bring the chief of them into the report published in our "Parliamentary Intelligence." To that report those interested must make reference, as a brief allusion here might only mislead. This may be said—that, despite the care and attention bestowed by them, the Committee have not succeeded in pleasing everybody. They have, however, done their best, under the circumstances; for there was no escape from the application of uniform methods of charging, after the creation of a body which established uniform administration of the water supply.

Gas-Producer Plant in New Zealand.—The first plant of any size, as applied to mining, is being erected by the Waihi Gold Mining Company, Waikino. There are two Crossley bituminous gas plants, of a total capacity of 1200 B.H.P., which are to use any non-caking bituminous slack coal. In the production of gas, eight Crossley engines, five of 200 B.H.P. and three of 50 B.H.P., are to be employed.

Rating of Limited Liability Companies in the City.—At the instance of the Corporation of London, a return has been published showing the number of voters in the City who do not directly pay rates, and the number of limited liability companies, societies, &c., who have no votes, and their approximate rateable value. The total rateable value of the City is £5,360,197, of which limited companies, public undertakings, &c., represent £3,428,089, or some 63 per cent. The total rate levied in the City last year was 6s. 9½d. in the pound, realizing £1,820,234, of which companies, &c., not represented on the register paid £1,164,122.

Water in Concrete.—The effect of water used in making concrete was much discussed among German concrete specialists in 1901, and to settle it about 99 tons of test pieces were made up by various parties and sent to Professor C. Bach, of Stuttgart, for test. This work lasted about four years, and the results have recently been published in the "Zeitschrift" of the Society of German Engineers. The records of the methods of preparing the test pieces and the amounts of water used in mixing the materials were forwarded with the samples. We learn from "Engineering Record" that tests of samples made by the same men under uniform conditions in Professor Bach's laboratory showed that the smallest amount of water which produced a mixture suitable for ramming gave the strongest concrete, but the highest degree of skill and care was required. Larger amounts of water enabled less competent workmen to produce good concrete; and in practical work they are an insurance against the injurious effects of varying degrees of moisture in the sand and stone, changeable atmospheric conditions, and other factors. These statements, says our contemporary, are the same as those made by concrete specialists in the United States, and indicate the extreme care necessary in basing field methods on the results of laboratory experiments by trained workmen. The tests represented work done under a great variety of conditions; and the specimens were representative of good German practice.

ELECTRIC LIGHTING MEMORANDA.

County Council and Company Co-Partnership—Lightening the Electricity Bill—The Progressives Incensed—The Nernst Lamp in Public Lighting—Renewals of Tantalum Lamps.

JUST what we expected would happen is going to happen, if the proposals of the Parliamentary Committee of the London County Council are entertained by the Hybrid Committee to whom the Council's Electricity Supply Bill has been referred. They reported last Tuesday on the modifications that they considered necessary in the Bill, to meet both the resolution of the reformed Council that the electricity supply undertaking contemplated by the Bill should be established at the risk of private enterprise, and as far as possible the desire of Parliament that the conditions upon which the Council's electricity powers are leased or entrusted to any Company should be embodied in the Bill or a future one. The Parliamentary Committee, on the whole, are desirous of acting very fairly by those who engage to carry on the undertaking. But there is one proposition that we think is opposed to the very spirit of the scheme, and will be prejudicial to its success and to the consumers of electricity, and, if sanctioned by Parliament, will introduce a principle that we hope will never obtain in this country—the evil effects of it having been seen in Paris and elsewhere in the maintenance of high prices for gas. The Parliamentary Committee contemplate provision being made in the Bill for sliding-scales of prices and dividends; but—and this is the questionable point—they also think that a proportion of the profits after the payment of a specified dividend should be allocated to the relief of the rates. The application of the sliding-scale of prices and dividends offers to the public ample protection and ample benefit, through the increase of dividend above the standard depending absolutely on reductions of price. But what is to happen under the proposal of the Parliamentary Committee? The scheme is intended to provide for the supply of cheap electrical energy; but the Committee are intending to put a drag on that purpose by retarding reductions in price in order to get a proportion of the profits after the payment of a specified dividend. We can fancy that private enterprise will not look upon such a condition with any degree of favour, seeing that whoever "takes on" this undertaking will have to compete with the established concerns that will be in a position to use in the competition all their surplus profits to reduce prices. We think that Mr. Lloyd-George, through a speech delivered some months ago, put into the heads of the Parliamentary Committee of the Council this notion of a proportion of the profit above the standard dividend going to the relief of the rates; and his suggestion was discussed in the "JOURNAL" for Feb. 26 last, p. 523. The idea is a co-partnership without one partner finding any of the capital, taking any risk, or providing anything if there is a loss, and doing an injury to the third partner under the sliding-scale—the consumer, whose patronage certainly does do something in building up and maintaining the business.

That is the most serious objection we can find to the series of proposals by which the Parliamentary Committee are seeking to lighten and modify the Bill. The Committee have thrown overboard the clauses referring to the compulsory acquisition of the electricity undertakings of the Borough Councils; and the scheme planned by the Progressives for filching from the Councils their purchase rights over the Electricity Companies' undertakings is also to be dropped. Seeing that these rights do not accrue until 1931, the Parliamentary Committee cannot see that there need be any immediate concern over them. Naturally, they are going to drop the financial clauses referring to the borrowing of 4½ millions for putting down new works; but it is intended to retain an item of £100,000 for the sites scheduled for the works at Erith and at Barking—just by way of precaution. It is also thought that a purchase clause over the undertaking contemplated by the Bill should be inserted, so as to maintain the principle of municipal control; the undertaking to become purchasable within a period of fifty years. It is also considered that a year is the utmost limit that the Council can fairly ask Parliament to grant them within which to make an arrangement for the working of the undertaking. Where the Council are likely to come into conflict with Parliament is over the instruction to the Hybrid Committee passed at the instance of Mr. Lloyd-George, to the effect that the conditions of transfer of the Council's powers should be embodied in the Bill or a future one. The Parliamentary Committee, however, think it is quite undesirable that they should specify in the Bill in any more than general terms the main features of any arrangement that may be entered into (see "Notes from Westminster"). The idea, of course, is that the Council should exercise supervision over the Company undertaking the supply of electrical energy; and that the present Parliament should be in a position to exercise supervision over the County Council to see that they do not depart from the sacred principle of municipal control.

It was highly amusing to see how badly the remnant of the Progressives took the dismembering of their scheme when the report came before the Council on Tuesday; and they were not over nice in the compliments paid to the destroyers of their plans. Terrible things are going to befal London from this caving-in of the Council to Trusts and so forth; but we incline to the opinion that the ratepayers will find these terrible things light in comparison with the burden the Progressives were anxious they should carry. They also raised their voices in sympathy with the Borough

Councils, who will, if the Bill passes, be brought into competition with the Company who run the concern. It was fantastic to see the County Council Progressives assuming the guise of friends of the Borough Councils, when only a few months ago, they were proposing to buy them out, lock, stock, and barrel, and, in their then supremacy, treated with cynical indifference the resentment raised in the borough council chambers. The view of the Progressives has changed since their standpoint was shifted for them by the ratepayers; but again in power, and the old view would be restored. The Progressives went so far as to assert that the Municipal Reformers were so shaping the Bill as to make the whole thing impossible, were producing danger by creating monopoly, and were contemplating something which would be destructive of municipal trading and control. What was meant by all this fulmination, we are not troubling to inquire; but for all this wickedness of the Moderates we are among those who are unfeignedly thankful.

The Fulham Borough Council have not altogether departed from the old flat-flame gas-burner system. For this backward state of things, no one can find any reason, seeing that the Council are robbing the ratepayers of the greater quantity of illumination that could be obtained by the substitution of incandescent burners for the flat-flame ones. They appear to be chary of advertising incandescent gas lighting through the public lamps. It has lately been decided that there shall be an improvement of lighting in the streets where electric cables are laid. Why confine improvement to these streets? The reply is obvious. In Fulham there is, of course, a Borough Electrical Engineer. He advises that Nernst lamps should be adopted in the streets where electric cables are laid; and he it is who says (defying all higher authority) that "while the incandescent gas mantle gives if anything more light immediately round a lamp-post, it has not the same distributive or penetrative power as the Nernst lamp." The Electrical Engineer reports this to the Electricity and Lighting Committee—that is to say, the Electricity Committee to whose disinterested care the public lighting is confided; and they, with an eye to business for their concern, brand their Electrical Engineer as a jolly good fellow for having found out something that no one has discovered before. The game goes on; it is all so simple. The Electricity and Lighting Committee advise the Council (who are responsible for this trading undertaking) to carry out the wishes of the Electrical Engineer; and a majority, without much consideration, endorses the recommendation. What chance has gas under such circumstances? The Electrical Engineer presented some figures showing photometric tests of Nernst, and flat-flame and incandescent gas-lamps, but the tests without more information than has been published are valueless. In the streets mentioned, the annual cost is to be increased by £187 through the adoption of Nernst lamps as compared with incandescent gas-lamps; and the cost of conversion is estimated at £582. The annual cost of the Nernsts is calculated at £3 7s. 3d. each; and the estimate of the Gas Company was £3 4s. 7d. per incandescent gas-lamp. We read that, "during the peak-load, the cost of electricity is only 1d. per unit, and *for the remaining hours* ½d. per unit." This is a statement by the Chairman of the Electricity Committee. It is difficult to see what he means; no doubt it has something to do with a cut-price at which the electricity is being supplied to the lamps. But as electricity is master of the situation in Fulham, the statement went down all right in the Council Chamber without inquiry. In the last analysis of the Council's accounts in the "Electrical Times," it is seen that the total average cost per unit of electricity was 1·26d., and that public lighting was being charged at 1·53d. per unit. Touching the efficiency of Nernst lamps, it was stated at a recent meeting of the York City Council that it had been asserted that flat-flame gas-burners were quite equal to the Nernsts which had superseded them. This no doubt is a little piece of extravagance; but it does show that the Nernst lamps there (without giving consideration to their constitutional troubles) are not doing all that it had been claimed they would do. On the same occasion, the Chairman of the Electricity Committee went into ecstasies over the flame-arc lighting of Oxford Street, and compared it with the single incandescent gas-burner lighting in Holborn. What a pity not to say something as to the relative cost of installation and annual expenditure! Also he might have pointed out that if Holborn spent per mile of gas lighting as much as the Marylebone Council have done, and are doing, on the flame-arc lighting of Oxford Street, he would then be able to talk of sunshine at night time in Holborn.

We have had some difficulty in obtaining from the ordinary channels of information, particulars as to the cost of maintenance and renewal of Nernst and Tantalum lamps used in street lighting. The expense involved in this direction by Tantalum lamps does not commend itself as economical to the Resident Electrical Engineer of the Erith District Council. He has been experimenting with four posts fitted with the lamps, and finds the life varies from 240 to 1150 hours—the average life of eight lamps being 546 hours. Taking this figure as a basis, the cost of renewals for the public lamps he calculates would amount to £737 per annum, as against £115 at present. The item is a serious one, and has caused the Engineer to prosecute his researches in other directions.

For lubricating gas-engine cylinders, one drop of oil a minute for each inch of cylinder diameter has been suggested as desirable practice.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 839.)

THE Stock Exchange had a rather chequered time last week with some ups and downs, but even that is tantamount to an improvement upon recent weeks, which had all downs and no ups. The opening gave some promise; for the general feeling was calm, forecasting an account which would be free from the terrors of the last. On Tuesday, the settlement began, the happier outlook endured, and there was a comfortable contemplation of better times coming as prices gradually improved. Nothing occurred on Wednesday to dim the prospect; and full advantage was taken of the reported revision of underground railway fares to bring about something like a rush on their shares. But on Thursday the horizon became overcast. Two failures over the settlement were announced; and, though small, they suggested disagreeable potentialities. A more or less general shrinkage took place, and markets became sensitive, operators being rather shy of dealing either way. Dulness and apprehension continued to prevail; and Saturday was agitated by fears and rumours in Continental directions, especially Russia. The close was thus darker than the opening. Among the factors responsible for weaker prices was a hardening of the Money Market. There was no stringency in accommodation for short loans, but discount rates tightened up considerably. Business in the Gas Market was below the average in volume, and movements were irregular. An interesting point was an advance in Gaslight and Coke, upon the Company producing a new fuel which is apparently much the same as the expensively advertised "Coalite." This may be a public benefaction if people will but learn in time that there is no magic in semi-carbonizing coal, and every gas-works in the kingdom may make "Carbo" if they like and if it pays. Gaslight ordinary was active at prices ranging from 90¾ to 92½. The maximum was done from 87½ to 88½, the preference advanced a point at from 101 special to 103, and the debenture at 83 *cum div.* South Metropolitan was moderately dealt in at from 121 to 122½. The debenture marked 84. The only dealings in Commercial were one in the 4 per cent. at 106 and one in the debenture at 82 *ex div.* In the Suburban and Provincial group, Brentford old was done at 246 free, ditto new at 191, British at 41 (a fall of 1), and West Ham at 104¼. Among the Continental Gas Companies, Imperial was firmer and more active at figures rising from 168½ to 171½—a rise of 2. Union was not dealt in; and European fully-paid changed hands at 23½ and 24¼. Malta was done at 93s. Among the undertakings of the remoter world, Buenos Ayres was dealt in at 11⅛ and 11⅜, Cape Town debentures at 50¼, Monte Video at 11 and 11⅛, Primitiva at 6⅞ and 7, ditto preference at 5 1/16 and 5⅛, River Plate at from 12⅝ to 13 1/16, ditto debenture at 96¾, and San Paulo debentures at 50⅛.

PERSONAL.

In the list of the latest additions to the Commission of Peace for Monmouthshire, we are pleased to notice the name of Mr. CHARLES WHITE, the Manager of the Blaenavon Gas-Works. Mr. White is an ex-Chairman of the Blaenavon District Council, and has taken an active part in local affairs.

In regard to the paragraph in our issue of May 14, referring to the appointment of Mr. W. Angus as Engineer to the Buenos Ayres (New) Gas Company, Limited, in Buenos Ayres, and as consultant for other concerns, we are asked to mention (in explanation, not correction) that this appointment has nothing to do with the Bahia Blanca Gas-Works, which are being erected by Mr. Arthur Gibson for the Construction Syndicate.

Marriage of Mr. P. C. Holmes Hunt.—Australian papers just to hand contain an account of the wedding, on the 16th of April, at Christ Church, South Yarra, Melbourne, of Mr. Philip C. Holmes Hunt, eldest son of Mr. Charles Hunt, and Engineer of the Metropolitan Gas Company, to Miss Frances A. Lugg, younger daughter of Mr. George Lugg, of Melbourne. Among the numerous presents were a silver tea-tray from the Directors of the Company; silver *entrée* dishes, &c., from the officers; and silver tea service, fruit knives and forks, &c., from the employees of the South Melbourne, West Melbourne, and Fitzroy works of the Company. To the good wishes expressed for Mr. and Mrs. Hunt on the happy occasion, we cordially add our own.

The Board of the New Paris Gas Company.—The new Company which has been formed to carry on the gas supply of Paris, under the supervision of the Municipality, recently held a general meeting at which the founder (M. Rouland, the concessionnaire) submitted the names of the following gentlemen to constitute the first Board of Directors: MM. Bargeton, Boudon, Boutan, Carnot, Cornuault, Damour, Dupasseur, Homberg, Rouland, Vacherie, and Watel-Dehaynin. They were all duly elected; and M. Carnot was subsequently chosen by them as their Chairman. Five of the Directors—viz., MM. Boutan, Cornuault, Damour, Rouland, and Watel-Dehaynin—are already associated with gas undertakings; and M. Cornuault, as our readers may remember, is President of the Society of Civil Engineers of France.

THE REPORT OF THE CHIEF INSPECTOR OF ALKALI WORKS FOR 1906.

By HAROLD G. COLMAN, Ph.D.

THE report of the Chief Alkali Inspector for 1906 has already been referred to at length in the last number of the "JOURNAL;" but some further consideration of those portions concerning chemical matters, especially in relation to ammoniacal liquor and the manufacture from it of sulphate, may be of interest.

Attention is again drawn to the causes of the formation of "blue" salt, which was fully discussed in last year's report. The conclusions then come to have been confirmed by further experience, and, with some exceptions, appear to have met with general acceptance from technologists and manufacturers. Since the report was written, however, Mr. H. J. Bailey, in a paper read before the Manchester Section of the Society of Chemical Industry,* has suggested that "local alkalinity" in the saturator is not necessarily the determining cause, but that the formation of "blue" salt is due rather to the partial cooling of the still gases before reaching the saturator, bringing about in these the condensation of water as a mist. Such water would contain dissolved ammonium cyanide, which would pass as such into the saturator. There seems, however, to be but little essential difference between the two views, as both require as a preliminary condition that ammonium cyanide should be first formed.

This compound does not exist in the gaseous state, as it is completely dissociated into ammonia and hydrocyanic acid when volatilized, and can only be formed when liquid water is present. When the mixed still-gases, free from condensed water, meet the strongly acid liquid in the saturator, the ammonia is so rapidly absorbed that there is no time for the formation of the much less stable, and more slowly formed, ammonium cyanide; but if the liquid becomes less strongly acid, the ammonia absorption takes place more slowly, and a time will come with decreasing acidity when the rate of absorption becomes sufficiently low to allow of the formation of some ammonium cyanide. This substance, when once formed, very rapidly combines with iron, if present, forming iron ammonium ferrocyanide which, unlike the cyanide itself, is not again decomposed when it mixes with the excess of acid in the other parts of the saturator. If, on the other hand, the conditions specified by Mr. Bailey occur—namely, sufficient cooling of the gases before the saturator to allow of steam condensing as a mist—the latter will at once dissolve both ammonia and hydrocyanic acid from the gases, forming a solution of ammonium cyanide, which thus enters the saturator ready formed, instead of being formed there; and before this has been decomposed by the sulphuric acid into ammonium sulphate and hydrocyanic acid, a portion of it will combine with any iron present, yielding iron ammonium ferrocyanide, and resulting in "blue" salt. In fact, whenever such mist containing ready-formed ammonium cyanide enters the saturator, "local alkalinity" exists around those liquid particles, although, doubtless, the alkalinity lasts only for a very short time. Mr. Forbes Carpenter points out that evidence as to whether the saturator contents will yield "blue" salt can easily be ascertained at any time by adding to a sample of the liquid an oxidizing agent, such as hydrogen peroxide, which gives an immediate blue coloration if any ferrocyanide is present.

Mr. Linder has during the past year continued his valuable work on the methods of analysis of ammoniacal liquor, the memoranda of which in the reports of the past few years are indispensable to those who have to carry out such analyses. The methods have now been so far perfected that the only alteration made this year is in the means used for the determination of sulphocyanide. Formerly this was done by precipitation as cuprous salt in the cold with copper sulphate and a sulphite, and estimating the copper in it by means of iodine. This method is found to give too high results in many cases; and in its place Mr. Linder has now adopted the procedure largely used in the analysis of crude sulphocyanides, based upon the well-known Volhard method of titration with silver nitrate. Before titration, it is essential to eliminate the thiosulphates always present, as these are also precipitated by silver nitrate; and to this end the solution to be tested is precipitated when hot with copper sulphate and a sulphite, when cuprous sulphocyanide is formed, mixed with the copper sulphide produced by the decomposition of the thiosulphate. The washed precipitate is then boiled with sodium carbonate or caustic soda solution, which converts the copper sulphocyanide into the soluble sodium salt, but does not affect the sulphide; the filtered solution being then acidified with nitric acid, and titrated with decinormal silver nitrate, using iron alum as indicator.

A method being necessary for the determination of the amount of hydrocyanic acid present in saturator gases, it appeared that the simplest plan would be to absorb the latter with a solution of ammonium polysulphide, and determine the ammonium sulphocyanide formed according to the above method. The quantity of sulphocyanide formed from such volumes of the gas as could be treated was, however, much too small to allow of the use of the copper precipitation; so that another method of getting rid of thiosulphate had to be devised. Mr. Linder, after removing sulphide by treatment with lead carbonate, has successfully overcome the difficulty, having discovered that the thiosulphate is almost completely converted into tetrathionate by digestion with iron alum solution at 90-95° C.; and as the tetrathionate has no effect on silver nitrate when quickly titrated, the solution may, after filtration and acidification with nitric acid, be at once titrated with the decinormal silver solution. Check tests showed the substantial accuracy of the method.

It is also mentioned that the iron-alum method may be used instead of copper precipitation, for the estimation of the amount of hydrocyanic acid in crude coal-gas by absorption with ammonium polysulphide solution, or in crude sulphocyanide solutions containing thiosulphates; this having been worked out by Mr. G. W. F. Holroyd, to whom Mr. Linder had communicated his results. Practically identical results are obtained by both methods in parallel tests. With this modification, the polysulphide test is by far the quickest and simplest method of estimating cyanides in coal gas. The results have, however, a tendency to be slightly high, inasmuch as a little of the carbon bisulphide in the crude gas is sometimes absorbed by the ammonium polysulphide, also producing ammonium sulphocyanide; and any bisulphide thus absorbed is calculated as hydrocyanic acid in the test. The error is usually small.

The results obtained in connection with ammoniacal liquor and sulphate manufacture by the application of the above methods of testing are of great interest, especially as regards the differences between gas-works and coke-oven liquors. It is clearly shown that the primary compound formed by the hydrocyanic acid of the crude gas in the liquor is ammonium cyanide, and that this is unaffected by the ammonium monosulphide formed at the same time. By the action of the air, the monosulphide is slowly converted into thiosulphate and polysulphide; and the latter, as formed, combines with the cyanide present, yielding sulphocyanide. In gas-works, where as a rule the liquor is stored for a considerable time previous to distillation, oxidation has proceeded so far that before distillation the greater portion, and sometimes the whole, of the cyanide has undergone conversion into sulphocyanide; but in coke-oven plants, where but little storage usually exists and the liquor is distilled as it is made, the reverse is the case—and the liquors going to the still contain large quantities of cyanide.

In distilling off the volatile ammonia, the hydrocyanic acid present as cyanide is likewise expelled along with the sulphuretted hydrogen and carbonic acid, while the sulphocyanide is unaffected; and it has been shown by analysis of both the liquor and of the waste saturator gases that the latter contain these three constituents in the same proportion as that existing in the liquor. As was to be expected from the analyses previously published of the liquors from different sources, by far the greatest amount of hydrocyanic acid was found in the waste gases from coke-oven liquors, much less from gas-works liquors, and none in those from shale and iron works. The average results are—

Liquor from	HCy in Saturator Gases per 100 Volumes.
(1) Coke-oven works, 1905	5·5
(2) Do. do., 1906	4·2
(3) Gas-works	1·6
(4) Iron-works and shale-works	*nil.*

In certain coke-oven works the amount of hydrocyanic acid has been found as high as 17 to 18 volumes per 100.

The necessity of caution in dealing with such a highly-poisonous gas is manifest, and fully justifies the attention drawn to the matter by the Chief Inspector. Care is also necessary, not only with the waste gases, but also with the "devil-liquor" formed by condensation from them, as this also contains much hydrocyanic acid. The amount dissolved in such liquor naturally increases as the temperature at which it is in contact with the gases falls, and when drawn off from the coolest point, it may contain as much as 0·7 to 1 per cent. of HCy; while if removed at the hottest point, the amount found only varies from 0·12 to 0·81 per cent. It is therefore most desirable the latter plan should be adopted. The elimination of the hydrocyanic acid from the cooled waste gases fortunately presents no difficulty, as under normal conditions this is completely absorbed by the oxide of iron used for eliminating the sulphuretted hydrogen.

* See "JOURNAL," *ante*, p. 522.

Society of Engineers' "Transactions."—We have received from the Secretary of the Society (Mr. Perry F. Nursey) the volume of "Transactions" for 1906, which has been prepared under his editorship. It contains the Inaugural Address of the President for the year, and the various papers read, with the discussions to which they gave rise. There is also a general index to the "Transactions" from 1857 to the end of 1906.

The "Builder" on "Coalite."—Referring to the subject of "Coalite" last Friday, the "Builder" made the following remarks: "If the general public can be induced to use 'Coalite' as a substitute for coal, a great improvement will be effected in the condition of the atmosphere of coal-consuming cities. In view, however, of the failure of ordinary coke to satisfy the requirements of the average householder, we are doubtful whether 'Coalite' will meet with much greater success. It has been stated that the price of 'Coalite' will be no higher than that of coal; but the price must depend upon that obtainable for the gas and other bye-products resulting from the manufacture. Unless the gas can be sold to existing gas companies at a good price, or the gas companies will undertake the manufacture of 'Coalite,' there appears to us little prospect that it can be profitably sold at the same price per ton as the raw coal from which it is made."

SMOKELESS FUEL FROM GAS-WORKS.

Demonstration by the Gaslight and Coke Company.

TWENTY-TWO years ago—in 1885—Mr. Thomas Newbigging, in his presidential address to the Gas Institute, suggested that the smoke nuisance could be got rid of by coal users carting all their coal to the gas-works, and receiving in return the fuel in smokeless form. That was, in effect, an anticipation of the now much-advertised "Coalite"—much advertised because the long-expected prospectus, Sir Francis Cory-Wright tells us, is now coming out in "a very short time." Rumour has had it that it has been going to make an appearance for some weeks past; but evidently there have been certain delaying hitches in the promoters' arrangements. It is not the prospectus, but the suggestion that Mr. Newbigging made, and the like of which we have on several occasions also made since Coalite (which has never been rivalled in the history of the world by anything but Aladdin's lamp) has been before the public. For instance, on April 30 we stated that a material in all respects the equal of Coalite can be produced by gas-works—if there is really a profitable demand for it—at short notice. The truth of this has now been completely demonstrated by the Gaslight and Coke Company; and last week, on the invitation of the General Manager, Mr. D. Milne Watson, a material they are producing was shown in use in one of the fireplaces at the Horseferry Road offices.

It has got abroad that gas-works are in a position to readily produce a smokeless material, with better burning qualities for domestic grates than ordinary coke, if a demand for it arises, and if the public are prepared to pay anything—perhaps less to gas-works—than the prices that are quoted by Coalite Limited. The investing public will be consulting their own interests by bearing this in mind, before confiding capital to a Company who will have no monopoly in the material for the period even of fourteen years, but only in the particular form of plant by which it is produced. But the fact of the possibility of gas-works being in a position to produce a like material is spreading itself; and the Gaslight and Coke Company have been approached by several people interested in the supply of solid fuel—smokeless or other variety—with the inquiry as to whether they are prepared to do it. The Company have, in consequence, been experimenting, and have discovered what they no doubt anticipated they would discover, that they can, from their ordinary carbonizing plant, produce what is required—a smokeless fuel which can be ignited in the same way as an ordinary coal fire, and has all the appearance of the show fires of Coalite Limited. This being established, it would have been improper for the Company to have concealed the fact until after a heavy sum of money had been sunk in Coalite, and then have come forward as competitors, backed by a very favourable position. The Company's experiments have not been carried to the point of exact measurement at which they can give precise working data. However, the whole secret (if such it can be called) is that they only carbonize the charge to the degree at which all the constituents that create smoke are exhausted, but not the whole of the constituents which are of value to gas-works, but which assist in the making of a cheerful, hot, smokeless fire, giving very little residue in the form of ash or dust. That is the simple treatment; and there is nothing special about it. A section of the public appear to be willing to pay a price for a smokeless fuel; and the price quoted by Coalite Limited is one which, if there is the demand, would more than compensate the Company for the labour involved in handling the extra coal required by them, and for the loss they would sustain in gas and residuals, through the, in gas practice, premature withdrawing of the charges from the retorts.

There are a few considerations to which the attention of the investing public ought to be directed in connection with the capacity of gas-works to furnish a smokeless fuel. But before mentioning them, there are some impressions to be put on record regarding the fuel and the fire inspected at Horseferry Road. Comparing the fuel with Coalite, the difference can hardly be detected; and it is not so friable as ordinary gas coke. It must be remembered by the public that gas suppliers must use some of the best classes of coal for gas-manufacturing purposes; and therefore the partially carbonized material is also of the best quality. It is in fairly large lumps; and this has an important bearing, in our opinion, upon the brilliant incandescence of the fire. Fires made with the gas-works produced material light up quickly; and there are the little flames curling about the top of the fire, which give additional life to it, in precisely the same manner as with Coalite fires. The material being in fairly large lumps does not lie in a compact mass in the grates; and with the fairly large openings thus left, one seems to be looking right into a mass of incandescent fuel, and certainly the radiating surface of the fuel is, through these openings, greatly increased as compared with the more compact coal fire. The fuel not lying closely together, also permits of a good draught through the fire; and this, we believe, has a material effect in maintaining the high state of incandescence. There is still another point. The fireplace in which this demonstration was made was on the top floor at the Horseferry Road offices; so that there was not a long chimney to create a big draught. The demonstrations with Coalite of which we have knowledge have been in basement fireplaces, or in fireplaces on the ground floor of high buildings; and consequently the chimneys have been of considerable length. We only mention this as a point of observation, without attaching undue importance to it, and also to show that the advantage of a tall chimney in the demonstration at Horseferry Road was absent. Nevertheless, the fire was an exceedingly bright one, the heat such as one can appreciate on a cold winter's day, there was no smoke, and the ash was infinitesimal.

Although no doubts were entertained on the subject before, we are perfectly satisfied from this demonstration that gas-works can supply a smokeless fuel equal in every respect to Coalite, if the public are willing to pay the price that will, as we have before put it, compensate for the losses sustained by departing somewhat from the ordinary course of gas manufacture. It is pretty certain that with gas coal at its present prices, gas-works can supply the smokeless fuel at below 25s. per ton. That is one consideration for the investing public to digest; and there are others. Coalite Limited have to lay out enormous sums of money on works' sites and expensive plant for the production of the fuel; and, in doing so, they are placed at a disadvantage compared with gas-works. Every gas-works has to keep surplus carbonizing plant to meet the requirements of the days of maximum demand for gas in the depth of winter. That plant is therefore lying idle during probably ten or eleven months of the year, and could well be employed in the production of smokeless fuel of the character of Coalite without any further capital expenditure. In addition to the plant being already there, gas-works are officered and manned. Then, again, Coalite Limited have no statutory powers to distribute the gas they make. They will be completely at the mercy of the gas-works in the neighbourhood of their own carbonizing works; and gas-works cannot afford to jeopardize their supply by entering into any speculative contracts for what may be an erratic and unpurified supply of gas of varying illuminating power. This would only mean a complication of their manufacturing operations, unless this was compensated for by the gas being supplied at an extraordinarily low price. Gas-works are under statutory obligations; and they cannot afford to run any risks, and over gas manufacturing operations wherever conducted they must, in consequence, have some sort of control. Gas-works, too, have already their markets for residuals. Furthermore, gas being their prime commodity, large gas-works can produce smokeless fuel of the quality of Coalite according to demand. They can increase or reduce the output just as the course of the market directs, or as prospects indicate. Coalite Limited, on the other hand, with Coalite as their prime commodity will be hemmed in by numerous risks. Besides being faced by competition, they will have to produce and keep their plant going in anticipation of the demand for the fuel; the greater regulation of supply to demand will be on the side of the large gas-works. Coalite Limited, too, will have to run the risk of being able to dispose of their gas; and, in disposing of their residuals, they will unquestionably have to face the very keenest of competition. In other words, there is nothing that Coalite Limited can produce that will not be exposed to competition from a number of producers who are more favourably situated than themselves.

We can only hope, in the public interest, that the public press will give due weight to these considerations, which can be so easily verified by a little inquiry. The demonstration by the Gaslight and Coke Company is beyond refutation. If a section of the public will not be happy until they get a grade of solid smokeless fuel superior to ordinary gas coke, or if they are not content (as a great section of the public are) with gaseous fuel, then gas-works are in a position to provide such fuel, at a compensating and profit-yielding price.

New Data on Concrete Steel.—Among the most complete series of tests that have been conducted of late, says the "Builder," are those of Professor Talbot on concrete-steel beams and columns. The results so far available have been published by the University of Illinois—the two most recent pamphlets relating to investigations made last year. The tests of concrete-steel T-beams are of more than ordinary interest because of the light they throw on the somewhat controversial question as to the proportionate width of floor slab that should be considered as forming part of the T-beams in floor design. Though these results are satisfactory and consistent, they are not sufficiently numerous to justify any precise rules for general application. Professor Talbot suggests the approximate method of calculating the maximum strength of T-beams by the ordinary rules for rectangular beams, considering the enclosing rectangle of the T-beam as the equivalent rectangular beam. This method, he states, is satisfactory for cases where the sectional area of the reinforcement does not exceed 1 per cent. that of the enclosing rectangle, and where the thickness of the flange is at least one-fourth the depth of the beam, and the width of the flange is not more than four times the width of the web or projecting rib. The tests of columns were conducted on members from 6 feet to 12 feet long by 9 inches and 12 inches square. Consequently, the results can be usefully compared with those obtained from previous experiments on columns of practical sizes. The necessity for conservative design is clearly demonstrated by the variable nature of the results, and the unusually low stresses at which some of the columns failed. Professor Talbot is quite justified in warning designers against the use of high working stresses for concrete-steel columns constructed under ordinary conditions with concrete of modern quality.

THE DISTRIBUTION OF GAS.*

In a volume of some 680 pages, Mr. Walter Hole has furnished a much-needed treatise on the principles and practice involved in the distribution of gas—that is to say, town gas. The author is the Superintendent of the Leeds Corporation Gas-Mains and Distribution Department, which gives him a right to speak with authority on this phase of gas engineering.

The distribution branch has of late years become an important factor in the commercial success of gas undertakings; and the engineers specially trained and engaged in the work are fast increasing in number. Of such consequence, indeed, has this side of gas practice become, that devolution amounts almost to a necessity, even in the smaller undertakings. This year, for the first time, "Gas Distribution" is recognized in the curriculum of the City and Guilds of London Institute as a distinct phase of engineering, with its own prescribed course of study and subsequent examinations. Mr. Hole's book therefore has come opportunely, and will be welcomed by a large class. The work appeared serially in the pages of our contemporary the "Gas World;" and the opinion then formed of the value of his articles has been confirmed by a re-perusal now that the contributions are issued in book form. The author may indeed congratulate himself on what he has accomplished, for he has provided on the subject of distribution, as he wished to do, "an up-to-date handbook for the gas manager, and a serviceable text-book for the student." It is a book which is eminently useful, clearly written, well illustrated, and therefore giving easily assimilated information. Further, it is probably, as Mr. Newbigging suggests in his introductory note, "the first and only work in any language to deal exclusively with the subject."

The author has laid under contribution every possible authority; but he conscientiously acknowledges the sources of his information. The apparatus of various makers is freely mentioned; and although this may savour of advertisement, it must be admitted the writer is impartial in his description, and the book would be distinctly the poorer without such references. Obviously, among the early duties of a distributing engineer is the study of the legal relationship between the gas customer and the supplier; and Mr. Hole properly devotes the first chapter to the "Rights and Duties of Gas Undertakings." From a distribution point of view the chapter is incomplete. One example of its inadequacy will perhaps suffice. Reference is made to the undertakers' duty to supply gas, and particulars are given as to the service and the meter, but nothing is said as to the law about the breaking-up of ground, safeguarding of trenches, reinstatement of streets, and the like.

Once the distributing engineer has satisfied himself as to the probable gas requirements of his district, his duty then is to determine the important question of sizes of mains to be adopted. The author devotes some 36 pages to the subject of "Discharges from Pipes"—working up from theoretical considerations to their application in practice, and giving several concrete examples of the method involved. In dealing with Dr. Pole's formula, he agrees that this is sufficiently correct for ordinary use. As, however, the formula refers to straight pipes, and makes no allowance for variation in the roughness of a casting, he is careful to point out how differences in level, bends, and friction may be allowed for—allowances more frequently than otherwise forgotten in text-books.

Mr. Hole carries the question into present-day politics when he deals in his fourth chapter with the discharge of gas under high pressure. The fact that gas can be economically distributed through comparatively small mains renders this chapter desirable. The inadequacy of Dr. Pole's formula in case of high-pressure distribution being acknowledged, some consideration is given respectively to Professor Unwin's new equation (in his Gas Institution paper of 1904) and several formulæ educed in American research. None of the suggested formulæ would appear to accord with the actual flow of high-pressure gas at all pressures; and the disagreement leads to the suggestion that there is great need for fuller research in the matter.

The functions of station governors are next dealt with, and examples given of the best known forms. This subject is naturally followed by the question of the districting of mains and the use of district governors.

Those having more particularly to do with main and service laying operations will have no cause to complain of lack of information in view of the 150 pages (Chapters 8 to 12 inclusive) which are devoted to the subject. Mr. Hole speaks of the composition of the iron employed for cast-iron pipes, and also of the method of casting, excellent illustrations being given of the process. In passing, he sounds a needed warning as to the danger of buying the light-section pipes frequently put on to the market through competition between ironfounders. He also enters fully into various methods of jointing main pipes, discusses the difference between (among other forms) open lead and turned-and-bored pipes, and evidently considers that the disadvantages of the latter outweigh their advantages. Undue prominence is given to cement and rubber joints. Lead wool jointing, by-the-bye, is not mentioned.

There is a separate and very readable chapter on main-laying proper; and the information given in this, and the previous chapter on "Jointing," seems so full that the veriest tyro after perusal should know how to set about this work. The author instances 30 inches as the minimum depth for mains which are subject to street traffic; and where this cannot be attained, he advises the precaution of concrete filling under and around the pipe. The necessary fall for mains is stated to be variously estimated; and the writer suggests that the fall should not be less than "1 inch in 10 feet." The latter would appear to be a mistake for 100 feet. These chapters on main and service laying are excellent. A little condensation would, however, not be a disadvantage, if only to permit of fuller particulars of costs of work, some treatment of the question of the reinstatement of roads, suggestions as to first-aid treatment in case of "gassing," and a few other matters.

The book has three chapters devoted successively to wet, dry, and prepayment meters. Each class is clearly described, and full illustrations not only of the meters themselves, but the phases of their action, are given. The chapter on prepayment meters contains a fairly full specification of what is required in a good meter of this class; and this is followed by fuller description and illustration of the general types of meter now on the market. No reference is made to methods and apparatus used for testing meters. This may not be required in a book on mere distribution; but questions as to the accuracy of meters come up more often than perhaps distributing engineers like, and the inclusion of a chapter on "Complaints and Repairs" suggests that dealings with consumers are in the day's work. In this chapter, Mr. Hole refers to the necessity of cordial relationship existing between the gas seller and buyer. The complaints, so far as they refer to distributors, are stated to be of two classes, (1) escapes, and (2) insufficiency of supply. Disputed meter registration should be added as a third.

Chapter 18 deals with valves and main cocks serviceable for main pipes and services respectively, and is followed by a discussion, in Chapter 19, on the use of subways for taking mains, cables, and other underground plant; some clear photographs and sectional illustrations being included.

An important subject—"Unaccounted-for Gas"—is discussed in Chapter 20. So far as comparisons are concerned, Mr. Hole points out the fallacy of contrasting leakage in percentage of gas made, and considers that the loss stated per mile of main is on a fairer basis. He willingly agrees, however, that this is not altogether adequate, and suggests that for the comparison it is necessary to take into account losses due to extensions and repairs of mains, leaking pipes and joints, incorrect meters, condensation in mains, imperfect working of lamp governors, and differences in temperatures. He further includes the consideration of the total length of the jointing surfaces of the various mains, &c. To some extent, all this is true. But many of the above might well be eliminated. If a comparison between undertakings is instituted, it is for the sake of contrasting their efficiency; and allowances should not be made for points which have to do with careless working.

Mr. Hole deals specifically with various causes that more or less seriously influence the leakage account. The effect of condensation seems to be much exaggerated. One cannot but agree with him, however, when he says that public lamp governor irregularities—and erroneous estimates of gas consumed might be added—may have considerable effect upon the apparent leakage figures. One other factor has probably been overlooked—that of the governing of pressures. It may be safely said that high pressures at the right hours have no serious effect; but their continuance longer than required is a mistake. In the case of governor loading by means of metal weights, the stepped appearance of the diagrammatic pressure line indicates successive although short periods of time when the pressure is in excess; and a case occurs to mind when a change to water loading, with its gradual transitions from day to night pressure and *vice versa* resulted in diminished leakage.

Public lighting, both of the low and high pressure type, with methods of ordinary and automatic lighting and extinguishing, are dealt with in some 140 pages. This subject may not be objected to as coming within the province of a distributing engineer. But if so, matters like the supply of gas to engines, fires, and fittings generally, equally call for treatment; and these are not discussed. Nevertheless, Mr. Hole gives an excellent account of the general position and methods of public lighting; and illustrations of almost every type of low and high pressure burner, with photographs of street illumination effects, are included.

One is disposed to join issue with the author on many points, as, for instance, when he says that for street-lighting purposes the superiority of the inverted over the vertical burner has been demonstrated. In the chapter on "High-Pressure Distribution," some particulars of valuable experimental and practical work are collected and furnished to the reader—a useful digest of methods and data published within recent years on the subject.

Mr. Hole, in issuing his articles in book form, has added a chapter on "Fusion and Electrolysis"—the "fell evils," as he calls them, which are surely, if slowly, beginning to evidence their presence. Some excellent photographs are reproduced; and these clearly indicate, almost without the necessity of description, the nature of both troubles. The author extracts from the Board of Trade regulations the principal points governing arrangements for return currents, and discusses the question as to whether or not these are sufficiently stringent. He follows with a reference,

* "The Distribution of Gas." By Walter Hole, of Leeds. London: John Allan and Co.; 1907. [Price 12s. 6d.]

among others, to the suggestions of the Electrolysis Commission of the German Association of Gas and Water Engineers. Fuller particulars might have been given of the data on which these were based. Nevertheless, the chapter is not lacking in information, and pending further knowledge (only to be gained by experience), should be carefully read by the student, in view of the fact that the rapidly growing number of electricity systems is increasing this possible trouble for distributing engineers.

Speaking of this book as a whole, we can, with confidence, recommend it. The author details methods of work in the various branches of distribution; and his illustrated descriptions will render a study of the volume both profitable and a pleasure.

INVERTED GAS-BURNERS.

UNDER the title of "The Evolution of the Inverted Gaslight," we have in recent issues devoted a considerable amount of space to a full abstract of the book written last year by Herr Friedrich Ahrens,* of Berlin, and just issued by the German press. In these circumstances, it is unnecessary to say anything further respecting the scope of the volume before us, except to remark that it contains two final chapters—dealing with inverted burners for railway carriage illumination, and burners consuming liquid fuels—of which no account has been given in our columns.

There can be no doubt that Herr Ahrens has prepared a most useful and topical book, if only because he has collected sectional diagrams and appended working descriptions of nearly all the inverted incandescent gas-burners that have been imagined or actually constructed in most civilized countries. The information contained in the volume would, in its absence, have to be laboriously sought in trade circulars and advertisements, and could only be correctly retained by a trustworthy and methodical brain. At the beginning of his different chapters, Herr Ahrens says a few words respecting the principles involved in the construction of the burners he is about to describe; and elsewhere an occasional criticism appears modestly, almost as if it had slipped into the manuscript by accident. A reader has perhaps no right to expect the author of a book on a semi-commercial and very competitive subject to "commit" any comparisons that can possibly be avoided; but at the same time if the latter shelters himself wholly behind principles and scarcely ever touches upon behaviour, his treatise can only prove of value to the limited circle possessing the technical and scientific training and the data requisite for the formulation of an *à priori* opinion.

The people who use gas-burners may be sharply divided into three classes. There is the skilled gas engineer; there is the careful and intelligent member of the public; and there is the ordinary happy-go-lucky individual who cannot be bothered with things. The first has in his person or employ a man possessing the knowledge and time needed to make even an inferior burner do its best, and to keep a good one in the pink of condition. He is apt to be most vocal on the subject, to receive most attention from the makers; he judges a burner by sheer efficiency, but does not represent the standpoint of the last class. The second class buys his burners on the recommendation of the first, though chiefly mute as to the results obtained. The last class overwhelms the two former by mere force of numbers. Its units care nothing for efficiency, and comparatively little for first cost. Its judgments are based on the ability of a burner to give light without trouble when grossly and systematically neglected; to a minor degree upon the frequency and expense of renewals. Hence its constituents regard a burner from a very different aspect from that of the first class; in fact the careless layman is often only persuaded to scrap his flat-flames by a species of bullying, and in his heart of hearts he regrets the good old costly days.

It cannot be denied that inverted burners are still somewhat delicate pieces of apparatus, or that large sections of the public are not really fit to possess them except under a constant supervision to which the householder would object. Thus in selecting a burner for the average consumer, we have to ignore our natural instincts of picking out one that gives high efficiency, specially favourable distribution for the purpose in view, one that appeals to us because its arrangements for preheating seem ingenious and effective, for a burner that smokes and smells as little as possible when the parlour-maid has closed the primary air inlets with her duster, that yields a respectable light when the inlets and the injector sides are choked with dust, that does not locally overstrain the mantle, and that does not soil the inner surface of the globe more than can be helped. On points like these, we derive but little information from Herr Ahrens' book: but, of course, it is doubtful whether we really ought to seek them. Nevertheless in certain directions he expresses opinions to each of which there is at least another side.

For instance, he disparages the type of burner that is constructed from an inverted cone of white porcelain. But the porcelain has the distinct advantage of not yielding and making conspicuous that white deposit of anhydrous sulphate which is so unsightly in the daytime on a brass deflector or hood. Certainly the porcelain renders any coating of soot peculiarly evident; but a sooting burner is one in so very parlous a state as to require immediate treatment by a professional operator. Again, Herr Ahrens votes for non-alterable primary-air inlets. But the average inverted burner is put on an ungoverned service, and is supplied with gas of whose composition the maker is ignorant; while the actual erector is by no means always capable of adjusting the nipple to suit local conditions, even if he is aware of the necessity. It would assuredly seem that capacity for air adjustment is needful, although the plan sometimes adopted, of copying the loose hit-and-miss device of the laboratory bunsen, is far from being a satisfactory method of achieving due control. If a revolving collar be employed, it is necessary first of all to see that the spaces between the holes are larger than the holes themselves (an elementary matter occasionally overlooked), and, secondly, to provide some locking arrangement to prevent accidental or curious alteration of the effective area.

Mortality among the glassware is another predominant factor in judging an inverted burner before introducing it to the public. Many breakages are doubtless due to the employment of badly-made or badly-annealed glass; but large numbers are brought about by the burners themselves. Some months ago the correspondence columns of our trade contemporary the "Ironmonger" contained many letters that were very unpleasant to read, letters asserting more or less baldly that inverted burners were unsuitable for use in churches and the like, owing to the danger arising from constant breakage. Herr Ahrens says little or nothing on this subject, in spite of the fact that to whatever extent a globe lies at the mercy of a bad or badly-adjusted burner, the cure for the trouble must come from the gas engineer or fitter. An inverted burner passing too much gas (through incorrect adjustment or absence of any) or carrying its mantle too near the glass, will smash a globe every evening directly a hole grows in the mantle in a certain spot—a hole so small as to look negligible. A globe slung from an insufficiently out-turned lip may be jammed by the supporting screws, or slowly unwind them if slack and subjected to vibration till it drops on the least convenient occasion.

On its purely technical side, within the bounds we have already mentioned, Herr Ahrens' book is comprehensively, lucidly, and judiciously written. The illustrations are excellently clear, the type is admirable, but it has no index, nor even a table of contents. Seeing that the volume is made up of descriptions of burners constructed by different makers, which the reader desires to compare and to study, the absence of an index (especially of an index of firms and of proprietory names given to the burners) is a serious blemish.

* "Das hängende Gasglühlicht: Seine Entstehung, Wirkung, und Anwendung [The Inverted Gaslight: Its Production, Effect, and Use]. By F. Ahrens. Published by R. Oldenbourg, Munich and Berlin; 1907. 278 pages and 391 illustrations. [6 marks.]

MUNICIPAL EMPLOYMENT.

ONE of those somewhat lively debates for which the Wigan County Borough Council are more or less famous took place at the last monthly meeting, with regard to a resolution "that the Borough Engineer be instructed to refuse employment to men recommended by any member of the Corporation in any department under the control of the Sanitary Works Committee." This proposition was objected to by one member, who contended that the Borough Engineer would not take the recommendation of members of the Council, with the exception of a very few. The resolution would never be put into effect, because some of the favoured few would be able to recommend their men again just as they had done in the past; and those who came from the district he came from would not have a shadow of a chance—just as they had been treated before. Another speaker on the same side agreed that favouritism was shown; and he stated that there were members of the Corporation who had acquired a certain amount of business in their own particular line simply through the influence they had in getting people to positions in the Corporation. Those who supported the resolution, on the other hand, seemed to think that it would prove effectual in putting a stop to a state of affairs to which they objected. One of these members remarked that it was not exactly fair for one part of the Council to point to another, and say that portion could get men on while the other could not, because it was well known throughout the town that men had been got on from every portion of the Council. Any resolution that would give officials the opportunity of stopping councillors and aldermen from palming men on the management ought to be on the minutes. The sweepers had had to go on four days a week, because they had been putting in too many men who were relatives and friends of aldermen and councillors. Another member said they had found in the past that when a new committee chairman or vice-chairman had been appointed, in a very short time, sometimes, his brothers, or his uncles, or some other of his relatives, were in a responsible position, going from places where they were getting 20s. or 25s., and becoming Corporation officials with 50s. a week. When November was coming round, people said: "That chap got me a situation, and I shall have to vote for him." Other speakers pointed out that further effects of the resolution would be to prevent members of the Council being pestered, as they were at the present time, with applications from people who were desirous of obtaining employment, and that it would leave heads of departments a free hand to engage men who were capable. On all accounts, therefore, the resolution (which was passed by the Council) seems to be desirable; and if there is any regret—beyond that called forth by the need for the step—in connection with the matter, it must be that such an instruction was not brought forward a long time ago.

THE VERTICAL RETORT-HOUSE AT THE OBERSPREE (BERLIN) GAS-WORKS.

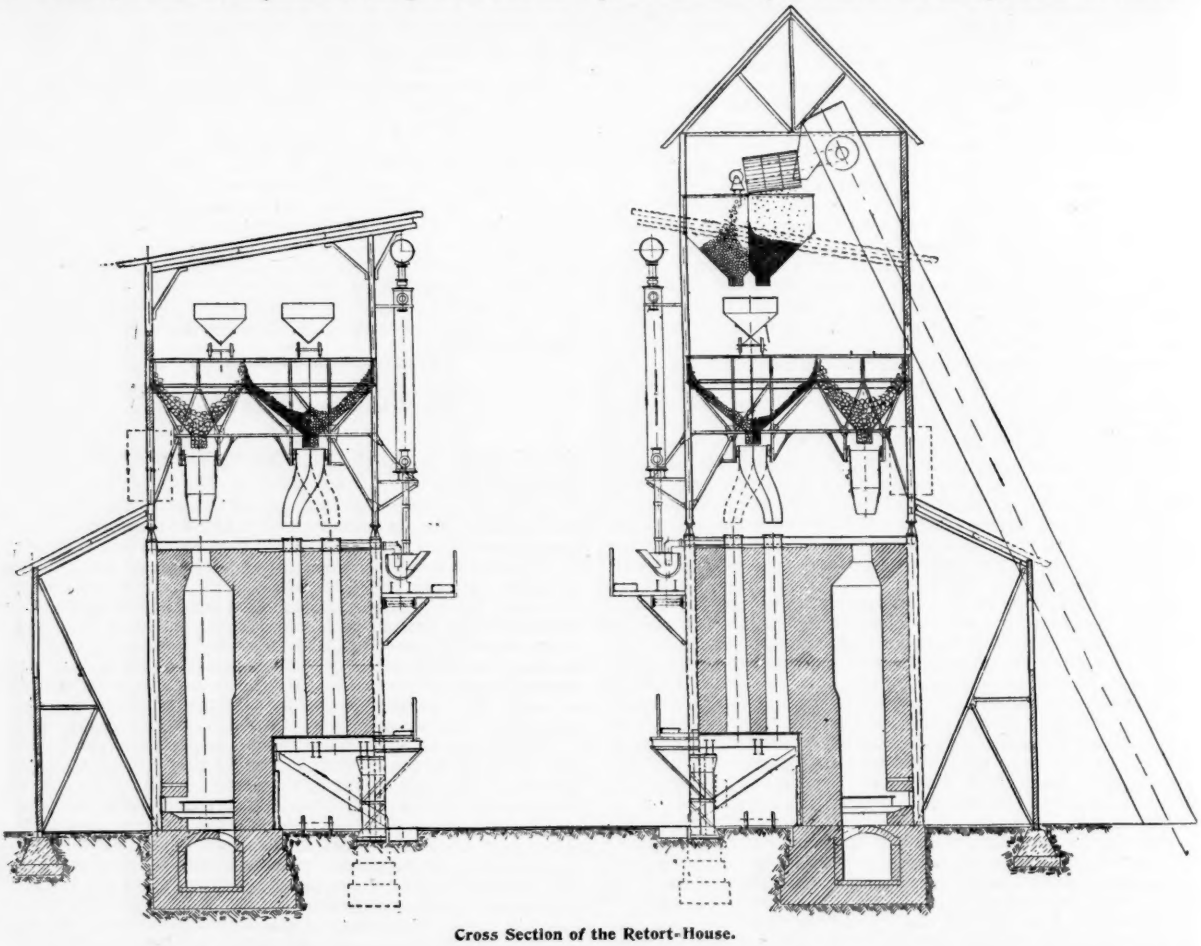
By E. Körting, of Berlin.

[A Paper presented at the Mannheim Meeting of the German Gas Association.]

The features that a gas engineer expects to find in a well-designed retort-house are invariably the same—viz., proper utilization of the ground space, good lighting and ventilation (unaccompanied by great loss of heat), and the utmost cheapness possible. Different systems of setting the retorts, however, involve fundamentally different methods of working; and therefore the houses containing them must be built in thoroughly appropriate fashion.

The problem at Oberspree has been to construct a house suitable in all respects for the working of vertical retorts; and three different operations—to be performed from three different positions in respect of the retorts, have had to be duly borne in mind. Of these operations, the clinkering of the furnaces is the most severe work, and is carried out on the ground-level at one side of the settings. The charging of the retorts with coal and of the generators with coke is effected from the travelling platform above. This work is not exhausting, but in summer is liable to try the men, owing to the heat evolved. The heat in question is, however, by no means comparable to that given off from the charging side of a Coze furnace. The retorts are discharged on the ground-level at the opposite side of the settings; but the man who attends to this operation has no hard labour to perform, and is not exposed to a high temperature, for as a rule he stands some 10 feet away from the brickwork.

It is thus evident that the coolest place outside the house should be assigned to the men who clinker the furnaces; and if the house is designed to contain two rows of benches, the discharging spot should be between them. But the clinkering operation does not require a lofty space for its due performance—a moderately low addition being sufficient; and so the wall of the retort-house itself at Oberspree is identical with that on the generator side of the settings. As this wall is pierced with numerous windows above the top of the settings, the men who charge the retorts are close to the fresh air, and can have as much of it as the weather renders desirable. The roof rises towards the centre of the house, but does not extend far beyond the inner walls of the benches—thus leaving a very wide space uncovered, through which the hot air may escape. The De Brouwer conveyors are placed immediately in front of the settings, under the central



Cross Section of the Retort-House.

opening in the roof; so that smoke and steam pass away at once, without inconveniencing the men on the top of the retorts. This situation for the conveyor is preferred to one beneath the retorts, because it keeps all the moving parts and the coke itself in sight. Power to retain the conveyor and the coke under constant observation is of great importance—tending to the avoidance of accidents and insufficient or else excessive quenching. The small distance between the two conveyors is also advantageous, inasmuch as it simplifies the commingling of the two lots of coke, when further common treatment is requisite. The wide space (30 feet) between the two benches, the broad opening in the roof, and the large sliding-doors in the end walls of the house ensure a thorough illumination and ventilation of the central passage, which, indeed, is really nothing but an open well.

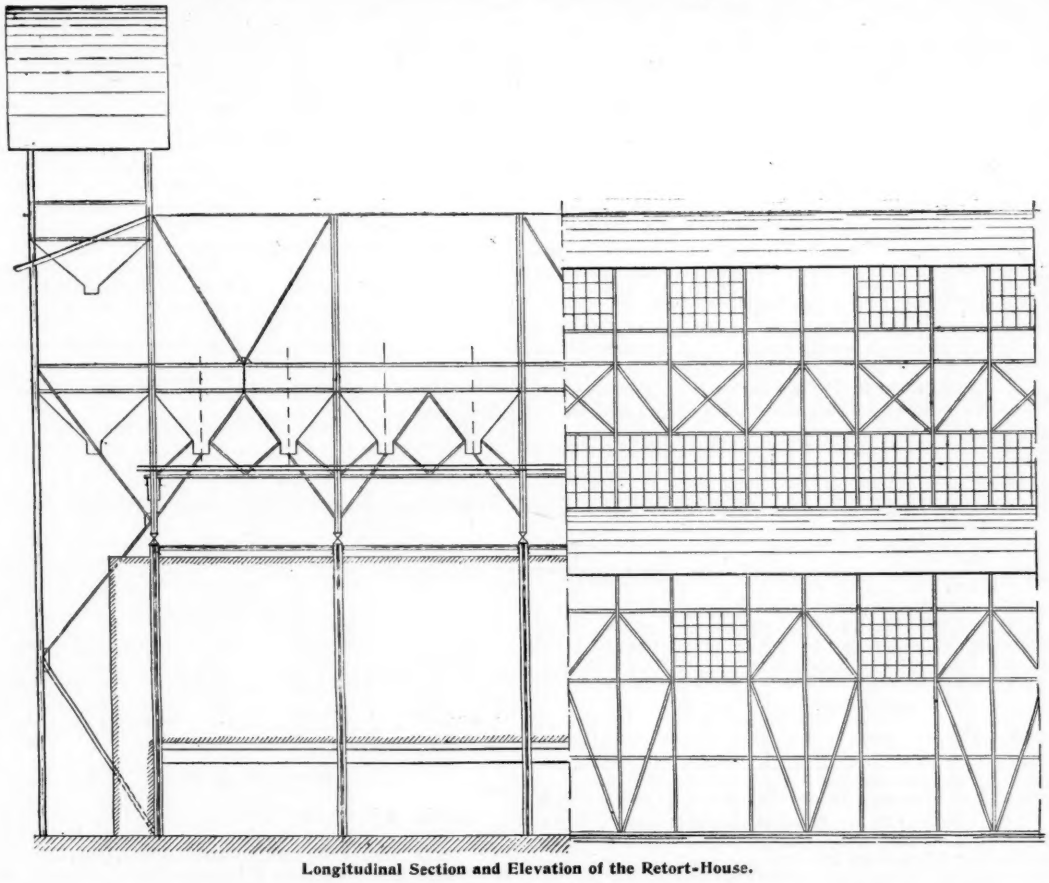
Practical experience gained in working the house has shown it to fulfil every requirement and to have no defects. In building it, convenience and economy were studied most of all. Wide roof spans are known to be an expensive item in constructional ironwork; and since in erecting Coze settings the main buckstaves are often employed to support the overhead coal hoppers, it occurred to the author to go further, and use the brickwork of the settings to carry the roof. The author has indeed had an opportunity of inspecting a special form of retort-house built at Bournemouth by Mr. Harold Woodall (one of the inventors of the Woodall-Duckham setting), in which the buckstaves are simply prolonged upwards and made to support the roof. This method of construction may very possibly answer in individual cases; but it must subject the component parts of the roof to uncontrollable stresses, and would probably be prohibited under the German building laws.

The author has therefore made careful measurements of the deformation that has occurred in the well-braced retort-benches at the different Berlin Gas-Works during the past many years, and has established the fact that, generally speaking, it has been very slight indeed. Armed with this knowledge, he consulted Herr K. Bernhard, the well-known statistician and civil engineer, in order to see if some method of construction could not be devised which should exhibit the advantages of the English plan without its defects—in other words, some method of construction in which the buckstaves of the retort-settings should be required to take vertical loads only, and should be free to move in other directions under the roof without affecting it in the least. This has been

accomplished by fitting the tops of the buckstaves with special sliding bearings, on which the tie-beams of the roof lie. The tie-beams act as supports for the coal-bunker and the conveyor rails. The buckstaves are prolonged upwards still further to carry purlins that support the roof-sheeting. The tie-beams are carried at their ends on the side walls of the house, which are so tied to the foundations of the retort-settings as to form a rigid whole. Thus the bracing of the furnaces is only employed to carry vertical loads; the lateral stresses being taken by the foundations and the outer walls. Security is obtained by connecting together the ends of the buckstaves that project above the brickwork by means of stout longitudinal and transverse ties.

A glance at the accompanying illustration will show that arrangements have been made in the Oberspree retort-house for the first time to keep the large coal separate from the small, and only to mix them when ready for carbonization. It need hardly be pointed out that if a vertical-retort is charged with fine coal, gas is evolved so rapidly as to set up a high positive pressure—a trouble that is not met with when large coal or nuts is used. To prevent the formation of a high pressure, it is not necessary that the entire transverse section of the vertical retort shall be filled with nuts. All that is needful is a vertical column of nuts extending from the base of the retort to its top, so that an open channel for the escape of gas may be present. Such a channel can easily be produced within the retort by charging it simultaneously, from two receptacles, with nuts and with small coal respectively. At Oberspree the broken coal falls from the elevator into a sorting drum, which fills one overhead store with large, and another with small coal. Each grade travels by itself to the hoppers over the retorts, which are divided into two continuous compartments by means of vertical partitions. The partitions extend downwards close to the emptying slides, and coincide with a dividing wall in the charging vessel. Thus when the lever is pulled the latter receives a charge of coal in which the lumps and the smalls are still separate. Separation, indeed, persists till the retort mouthpiece is reached; and yet the whole arrangement works quite smoothly.

The author is convinced that a similar device would behave well if applied to inclined or horizontal retorts. It is well known that separation begins to occur directly mixed coal is fed into an elevated store—the lumps travelling to the sides of the vessel and the small remaining in the middle. The conditions that govern the satisfactory charging of a retort are totally different when the coal is large and when it is small. The operation cannot therefore be efficiently performed if the size of the coal varies constantly. If a gas engineer is enabled always to put a uniform mixture of large and small coal into his retorts, he is in a position to obtain better results than he otherwise could; and the simplest and best method of achieving this end is to keep the two sizes apart until the very moment of charging.



Longitudinal Section and Elevation of the Retort-House.

THE MANNHEIM GAS-WORKS.

By J. Pichler, of Mannheim.

[A Paper presented to the German Association of Gas and Water Engineers.]

Mannheim is a town that has grown with such rapidity that the original gas-works—built in 1852, and handed over to the Municipality in 1873—were found to require enlargement a few years afterwards. New works, costing about £70,000, were therefore erected at Lindenhof, and were brought into operation at the close of the year 1879. The plant had an annual capacity of some 178 million cubic feet; but by 1886 the consumption had reached a similar figure, and further enlargement was imperative. By increasing the size of the retort-house and the holders, the annual output was raised to 280 millions; but it was felt desirable to build a second gas-making station at Luzenberg. This was done; and carbonization began in November, 1900. Mannheim therefore possesses two gas-works at the present time, the newer of which—that at Luzenberg—are making from 600,000 to 700,000 cubic feet of gas per day, while the older works have to supply the remaining demand. A new bench of six settings of retorts is now being installed at Luzenberg, and when the additional plant is ready it will be possible to close the Lindenhof station during the summer months. Both works, however, will be kept running for the next few winters, though the plant at Luzenberg has been so arranged as to be capable of easy extension; the object being to ascertain by experience whether the total extinction of the old works would be generally advantageous.

THE LINDENHOF WORKS.

The plant at Lindenhof has a daily capacity of some 1¼ million cubic feet. The retort-house contains two groups of eight settings each, arranged in a single row, each setting having nine horizontal retorts 9 feet long, and self-contained generators. There are also three settings of six retorts each, heated with coke dust; but these are only used occasionally. The furnaces and generators were originally designed according to the Tonnar system; but they have been remodelled on modern lines. Each pair of settings has only one hydraulic main, with adjustable seals and draw-offs for the tar and liquor. The gas, liquor, and tar pass through two 16-inch mains to the condenser and scrubber, which are located in a house 50 yards distant. At the inlet of the mains is an automatic safety-valve, which opens and allows the gas to escape if the pressure in the hydraulic main should accidentally reach 2 inches. The retorts are charged with 300 lbs.

of coal by means of the hand scoop, and are drawn with the rake. The coal comes principally from the Ruhr and Saar districts; but a little is obtained from England. The carbonization period is four hours for the Saar coal and five hours for the others. The coke is removed on light sheet-iron tipping-waggons. Mechanical conveyors have not been laid down, on account of the probable abolition of the works.

The coal-store is disposed alongside the retort-house. It has eight railway sidings, space for filling the tipping-trucks, and holds 1700 tons under cover. The small trucks carrying the coal to the retort-house are drawn by gas locomotives. A second similarly arranged coal-store, holding 4500 tons, is situated on the east of the retort-house; while two uncovered spaces in the yard are left for the occasional storage of more. The coke plant is on the north-west of the retort-house, and comprises water-towers, a place for quenching, two breakers, an elevator, and a pair of 3 H.P. vertical gas-engines, all under cover.

The condenser and scrubber house contains eight cast-iron air condensers, 4 feet in diameter and 16 feet high, each fitted with fourteen 4-inch air-pipes; also eight wrought-iron water condensers, 4 feet in diameter and 20 feet high, with eighteen 4-inch water-pipes, and eight cast-iron ammonia extractors 6 feet in diameter and 20 feet high, filled with Zschokke's material. The extractors are used in series, and fed in rotation with a constant supply of liquid. Wells for tar and liquor are under the corresponding washers, and communicate with the respective reservoirs. Overhead are tanks for fresh water, weak liquor, and tar.

The machinery-room adjoins, and contains two Pelouze and Audouin tar-separators, each having a capacity of 400,000 or 500,000 cubic feet per 24 hours; three of Beale's exhausters, with bye-passes and valves; two horizontal steam-engines of 6 H.P. and 8 H.P. respectively; two steam-pumps for clean and boiler-feed water; one boiler-feed pump driven by gearing; and one compressor for the gas locomotive.

Opposite the machinery-room is a building containing three station meters; two governors with water-loading for the day pressure, and a third for the evening; an automatic safety bye-pass between the holders and the distributing main; the inlet and outlet valves of the holders; and an apparatus for cold carburation. In the passage joining the meter-house to the machinery-room is a small direct-current dynamo actuated by a gas-engine, whereby the different buildings are lighted at night.

The boiler-house is at the side of the machinery-room, and contains three boilers, two of which have heating surfaces of 240 square feet, while the third has a heating surface of 290 square feet. Both furnaces are fed with fine coke. In an adjoining apartment is a Steinmüller feed-water softener, capable of dealing with 330 gallons per hour.

The purifier-house lies towards the south, 12 yards away. It contains two sets of four cast-iron purifiers, each having a superficial area of 167 square feet. The covers are raised by means of a traveller running on rails on the floor. The revivifying floors are on either hand.

There are three gasholders with a joint capacity of 950,000 cubic feet. Two have masonry tanks, and the other has a wrought-iron one. In the south-west corner of the yard is a Feldmann continuous ammonia still. Minor buildings contain the laboratory, workshops, stables, canteen, washhouses, offices, dwelling-house, &c. There is upwards of half-a-mile of rails on the works, enabling railway waggons to be arranged and taken where necessary.

THE LUZENBERG WORKS.

The plant at Luzenberg at present has a maximum capacity of rather more than 1¾ million cubic feet per diem. The retort-house is now provided with twelve Coze settings, each containing nine 12 feet inclined retorts, arranged in two opposite blocks of six settings. The retorts are charged as usual from overhead hoppers; the coal-conveyors being so arranged that in the event of a breakdown both rows of hoppers can be filled from either conveyor. The producers are built under the discharging floor, and are fed with incandescent coke directly from the retorts. Each setting has its own hydraulic main with adjustable dip; also apparatus for maintaining constant level and exit-valves for the tar and liquor. The retorts discharge on the two outer sides of the benches; and the coke is taken on Marshall-Blum conveyors to transverse conveyors which carry it outside the house. The transverse conveyors are built in duplicate, as they receive all the coke made; thus in the event of one breaking down the other remains at work. The longitudinal conveyors in front of the settings are 2 feet wide and 1 foot deep; and the rising transverse conveyors are 2 feet each way. The former are driven by a 3 H.P. alternate-current motor; the latter by one of 4 H.P. At the end of the transverse conveyor track the coke is either thrown out on to the breaker or transferred through a small hopper into an electrically-worked suspended railway (just constructed), and distributed in the store. The quenching appliances arranged along the longer walls of the retort-house were originally designed for the treatment of the coke removed in wheelbarrows; but since the installation of the conveyors they have been retained in reserve.

At one end of the retort-house are the baths, canteen, dressing-rooms, &c. The baths and basins are provided with a constant supply of warm water. Beer and soda water are supplied at cost price; but coffee is given free—the town bearing the expense. Close by are the laboratory and the manager's room.

The coal-store, at the opposite end of the retort-house, has a capacity of 7000 tons. To transfer the coal to the retort-house, it is put into trucks, and led to one of the two breakers, whence it falls on to the elevators. These lift it about 80 feet high into the conveyors above the retorts at a maximum speed of 20 tons per hour. The elevator and the conveyors are driven by a 7 H.P. alternator. The hoppers in the retort-house hold sufficient coal to last about 60 hours; so that the handling plant is idle on Sundays and holidays.

In the condenser-house are four Reutter water-cooled condensers, arranged two in series, supplied with fresh water and liquor. They are provided with exits for the tar and liquor having glass covers, so that the working of the apparatus can be watched.

In the machinery-room are two exhausters and governors coupled to steam-engines, each having a daily capacity of from 900,000 to 1,000,000 cubic feet. Underneath is a Worthington steam-pump which raises water from a 2-feet tube-well for the general purposes of the works; a connection to the town mains being held in reserve.

The washer-house contains two Pelouze and Audouin tar-separators, with a total capacity of about a million cubic feet per day. Two "Standard" washers, each coupled directly to its own steam-engine, are used in rotation to recover the ammonia. A naphthalene washer, equal to the treatment of nearly 2 million cubic feet per diem, with its steam-engine, comes next. It can also be employed to extract the cyanogen. Tanks for fresh water, weak liquor, and tar are placed above the washers; the fresh water serving also to supply the steam-boilers. The tar and liquor wells are near, and are emptied by means of six Worthington pumps fixed immediately above them.

The boiler-house contains two boilers, each having a heating surface of 860 square feet, and yielding steam at 8 atmospheres pressure. The steam is employed in the engines, for heating the holder seals, the rooms in the works, the baths, and the liquor concentrator. The boilers are heated with waste coke, and fed with two steam-pumps through a Schmidt water-meter. Adjoining the boiler-house is a room containing the feed-water softener and the plant for preparing strong liquid (aqueous) ammonia. The latter is capable of working up 440 gallons of liquor per 24 hours. It comprises a still, reflux condenser, carbon dioxide separator, condenser, and the necessary accessories. The apparatus is now being enlarged.

The gas is purified in four cast-iron boxes, each having a superficial area of 450 square feet. A traveller is employed to lift the covers and bring in the material. The revivifying floors are on either side.

The meter-house contains the station meter (passing about a million cubic feet of gas per day), the gasholder valves, and the governor. It is large enough to contain all the plant required when the works are enlarged to five times their present size. The holder is telescopic, has a wrought-iron tank, and a capacity of nearly a million cubic feet.

The works are provided with two lines of rails communicating with the public railway outside, an overhead line to take the coal into store, a surface line with three turntables for general purposes, and a cart road. It also comprises offices and dwelling-houses for the manager and foreman.

Electrical plant is erected in a special building, containing a 50 H.P. horizontal single-cylinder gas-engine to drive a Brown alternator at 1000 revolutions per minute. The current is of 120 volts, and has 60 alternations per second—synchronizing with the public electricity supply. The latter can thus be utilized in case of emergency.

THE DISTRIBUTING SYSTEM.

Mannheim is supplied with gas from two mains, one issuing from the Lindenhof and the other from the Luzenberg works. The largest main is 32 inches in diameter. At the end of 1906, the total system was about 184,000 yards long, and it supplied 24,113 meters and 3135 street-lamps. About 155,000 yards of main were within the borders of the old town, the rest passing to the outlying suburbs. Roughly, 22,000 of the meters were dry; 11,482 of the total measured gas is used for lighting purposes, 12,126 for cooking and warming, 98 for engines, and 407 were prepayment meters. The old town contained 2803 public lamps; the remaining 332 being distributed over three suburban districts.

Sir William Perkin, F.R.S., has been elected President of the Faraday Society for the session 1907-8.

A gas-mantle has recently been patented in Germany in which the mantle itself consists of nothing more than an egg shell; this being, according to the patent specification, "particularly well suited for acetylene gas-burners." The egg shell is converted into a glowing state by combustion of the gas inside; and it is said to spread a "pleasing and agreeable light."

Tar as a colouring material for mortar has recently been used in the United States. In erecting a number of houses the bricklayers ran short of black mortar colour and used as a substitute some tar which had been partially refined. After a lapse of several years it is claimed that the colour is as strong as ever—showing a remarkable newness—where the mortar made with usual colour will need repairing and pointing-up before long.

NOTES ON THE PRIME COST OF GAS.

By E. Körting, of Berlin.

[A Paper presented at the Mannheim Meeting of the German Gas Association.]

The man who lives in plenty has no need to study expenses; but he who is compelled to put forth all his strength to earn daily bread must consider his every outlay. The gas industry has undoubtedly experienced many fat years. Raw materials and labour have been cheap, absence of competition has enabled high prices to be charged, the slow and steady development of the manufacture has kept capital expenditure at a low figure; so that municipal and private gas undertakings have yielded gratifying returns. To-day conditions have changed in many respects, and the outward signs of prosperity are no longer evident on every side. For instance, in the course of a recent debate upon the maintenance of the City Hall, the Treasurer of Berlin expressed his dissatisfaction with the profits earned by the Municipal Gas-Works. Similar observations have been made by the shareholders of German gas companies; for, in spite of thoroughly efficient financial management, the two largest undertakings (the Imperial Association and the Dessau Company) only paid 8 per cent. last year, while the works at Magdeburg paid 7 per cent., Cologne 6 per cent., and Molte 5 per cent.—figures which can scarcely be regarded as indicating brilliant success.

The cause is to be sought in the great reduction in the selling price brought about in most places through the competition of electricity and the economic conditions prevailing among many classes of the population to whom gas is a vital necessity. On the other hand, the prime cost of gas has risen—mainly because of the serious and continued increase in the price of coal. Coal has risen in price because the miner constantly demands higher wages, and raises less to the surface; and also because the general expenses of mining have grown owing to the greater depth of the pits and the larger consumption of wood in the workings. Hence, even if the present commercial prosperity of the country is altogether ignored, no permanent check to the upward tendency of the coal market can be anticipated. Moreover, the price of coke generally tends to fall, as the following figures show. In the seven years following 1890, the average price paid in Berlin for gas coal was 17·50 marks per metric ton, and the average price received for gas coke was 20 marks. In the years following 1900, these figures were exactly reversed; coal costing 20 marks, and coke fetching 17·50 marks. Thus in ten years the net price of coal has risen 3·75 marks per ton; or, in other words, deducting the price obtained for coke, coal now costs 1¼ pf. per cubic metre of gas more than it did ten years ago.

Another heavy burden borne by the gas industry is the steadily growing cost of labour. Municipal undertakings suffer more in this way, and occupy a more critical position towards their men, than is the case with private companies. The hands engaged on a municipal factory are all electors, sending their representatives to the borough councils, where they agitate and carry resolutions for higher wages and shorter hours, such as private enterprises have found it impossible to grant. Thus the municipal employee is used as a lever to extort money from the private trader for the benefit of the ratepayer. The effect produced on gas-works by this political system is naturally very great, and wherever it obtains, expensive machinery has had to be substituted for hand labour. Twenty years since, a pair of wheelbarrows for the coal and the coke, a shovel, a low retort-house with direct-fired retorts were the only plant needed for the carbonizing operation. Now there must be a store for the coal fitted with a mechanical grab, a breaker, elevator, and overhead hopper, a high retort-house suitable for inclined or vertical retorts, and machinery for handling the coke. Hence during the past 20 years the capital costs at the Berlin works of the author's Company have risen by 60 per cent. per unit of gas made annually, and in many municipal factories have probably increased much more. No wonder, therefore, that the net profit is barely a third of what it was in the happy days of direct-fired retorts. In these circumstances—and presumably all gas engineers have gone through the same experience to a greater or less extent—the gas maker must take every precaution that his commercial position does not becomes still worse in future; and to do this he must subject his manufacturing processes to careful analysis, he must keep his books minutely and intelligibly. Such questions as these must be soluble: What does the gas cost? How can the total cost be so subdivided into separate items as to give the most useful information possible? What expenses are rightfully charged to revenue, and what to capital? A general dissection of the cost can easily be compassed by studying the process of manufacture.

Costs of Manufacture.

As the gas is made in a factory and delivered through an extensive district—operations that require supervision—the total cost of the gas may be divided into five chief sections: (I.) The cost of manufacture; (II.) the cost of distribution; (III.) cost of management; (IV.) general expenses; and (V.) depreciation. Item I. may be further subdivided thus: (1) Cost of coal and subsidiary expenses properly set forth, (2) cost of purification, (3) salaries, (4) wages, and (5) maintenance of the plant. It is very desirable that the wages and power expended in preparing and handling the coal and coke should be entered separately in the books from the actual prices of the coal and coke, so that the former items, which usually exceed by far all other manufacturing wages, may be capable of examination month by month, or at other intervals. Such a system enables the engineer to see whether a mechanical handling plant ought to be erected on a given works, and whether, where present, it is successful or the reverse. Furthermore, the quantity of the expensive and volatile ammonia which leaves the carbonizing works should be noted carefully, so that the gas engineer may know how much he has supplied to the recovery plant, and how much has been produced there in a state fit for market. Again, the coal carbonized contains a certain proportion and amount of water; and in its treatment so much is lost and so much recovered. If the plant is so arranged and the books so kept that questions like these can be answered, the extra trouble involved will be quickly repaid by the discovery of spots where pecuniary leakage occurs.

It has not hitherto been customary, although it is strictly correct, to charge to manufacture the salaries of the officials who are wholly engaged therein. Manufacture of gas is only possible when the factory is kept in good order; and therefore the expenses of maintaining the works itself in proper condition should be charged to manufacture. But the total manufacturing cost should be dissected into as many separate items as possible. In the following list, which refers to the works at Mariendorf, the manufacturing costs have been analyzed into as many as 39, with the aid of which it can be ascertained at any moment how the hand labour used in one factory compares with the mechanical plant in another, how vertical retorts compare with inclined and horizontal retorts, and so on. The total manufacturing costs incurred at Mariendorf are dissected thus:

A.—Buildings: Water-gas plant house; paving; river front, boundary walls, and fences; stores, workshops; retort-house and attached engine-rooms; exhauster, engine, and boiler houses; purifier-house; meter and governor house; dwelling house and office; bath and canteen rooms; water-tower; and sundry buildings—conveyor-houses, sheds, and lavatories.

B.—Plant: Retort-furnaces; fittings of ditto; coal-handling plant; electrical plant; retort and furnace tools; sundry tools; condenser; exhauster, with steam-boilers, engines, and pipes; tar-washer; "Standard" washer; cyanogen and naphthalene washer; purifier; station meter; holder; holder tank; coal breaker and hoist; pipes, valves, and connections on the works; coke tools; elevated and narrow-gauge railway; main railway; locomotives; De Brouwer coke-conveyor; coke breaking and storing; water gas; tar and ammonia tanks; compressing plant; and sundries.

Costs of Distribution.

The costs involved in distribution are made up of (1) salaries, (2) maintenance of the distributing and high-pressure mains, (3) maintenance of private connections, (4) maintenance of street-lamps, (5) attention to the street-lamps, (6) maintenance of the meters, and (7) installation costs. Relaying, drilling, and repairing the mains are obviously maintenance costs, and should be charged to revenue; but the position is somewhat different when a pipe that has become too small is replaced by one of larger diameter. In this case, the author thinks that the labour and the packing material should be charged to revenue; while the cost of the new pipe, less the value of the old, should be charged to capital. The cost of maintaining the distributing system, which amounts to a considerable sum, should be sub-divided thus: Enlarging, relaying, repairing, drilling; erecting service pipes and consumers' meters; removing meters; changing meters; moving the position of meters; motor-car service, pipe store, packing material and fuel, tools, maintenance of district offices.

The service-pipes leading to consumers' premises are very uncertain assets; for they are liable to be cut at any moment and rendered worthless. Their value should therefore be written off at once, and put down to current expenses. Under the heading of installation costs, everything should be included which the good man of business employs to stimulate the consumption of gas—installations in private houses, coin-freed meters, and the cash sale, hiring, and sale by instalments of gas-fittings, stoves, and various apparatus.

Costs of Management.

The costs of management are not so serious in amount, but are no less important than those already discussed. They may be divided into: Fees of the managing committee or directors, salaries, collection of accounts, and office expenses. It will be noticed that the item of salaries has appeared in each of the three preceding sections. This method of entry is desirable in order that the experienced business men on the council, or the borough officials, may be able to ascertain from the annual accounts (1) whether new methods of management have brought commensurate advantages with them, and have reduced unnecessary clerical work and office routine to a minimum; also (2) whether the men at the head of the enterprise are being sufficiently remunerated. The colossal business undertakings of to-day make such enormous demands upon the brains, nerve-power, and energy of the technical men who conduct them, and of the commercial men who control them, that only individuals of exceptional powers are fit for the work; and in view of the competition of private trading concerns, they deserve adequate salaries.

The costs of management may further be sub-divided into: Legal expenses, pensions, meter inspection and reading, rates and taxes, bad debts, and sundries. Much difference of opinion exists

on the subject of writing-off, although in some cases the necessity is manifest. Meters, for instance, only last a certain time; and the same remark applies to coin-freed apparatus, and to fittings lent on hire, the value of which is also subject to the dictates of fashion. All these articles should be completely written-off in ten years. But as regards gas-works belonging to a town, some persons hold that writing-off is unnecessary, inasmuch as the reduction in value of the plant must be more than counterbalanced by the increasing value of the land. In most instances, however, the author believes this view to be incorrect. The wonderfully rapid development now taking place in the gas industry causes the plant to become obsolete much more quickly than in years gone by. Moreover, when the time comes to erect a new factory in place of one so old that it was originally built in the open country but is now surrounded by houses, it will generally be found that our forefathers were very clever in selecting a convenient spot. Indeed, it may very well happen—as it did in a particular case known to the author—that on capitalizing the increased costs of moving the coal, coke, and gas to and from the new factory, a larger sum is required to represent them than corresponds with the enhanced value of the old land. Hence legitimate finance demands sufficient depreciation allowances, even on a gas-works, although there may be some dispute as to the proper rate. An average rate of 4 per cent., as is allowed in Zurich, appears fair. Thus the total cost of the gas is made up of the combined items which appear under the headings of manufacture, distribution, management, general expenses, and depreciation. Limited companies must naturally make copious deductions from their gross revenues for the provision of reserve funds —reserves for accidents, for renewals of plant, for equalization of dividends, &c.; and the author believes that municipal undertakings would find it equally advantageous if they made similar provision to equalize the receipts of the factories, and to secure their budgets from unpleasant surprises.

When the total cost of the gas has been ascertained in a trustworthy manner, it becomes possible from the total receipts to calculate the net profit. The ratepayer or shareholder, however, ought also to be able to judge whether due economy has been exercised in erecting the plant. For this purpose, the annual accounts should show how much has already been spent on the works; but the sums set aside for redemption should be entered separately, and not deducted from the total. The redemption fund, in fact, is an investment, and must be regarded as the property of the ratepayers or shareholders. On dividing the total capital by the annual make of gas, a figure is obtained which shows what the engineer has done with the money entrusted to him. Finally, from the total capital and the net profit, the percentage profit can be calculated.

Owing to the extensive employment of gas at the present time, the dividend paid by the works should not be very high. The law prohibits a tax on fuel. A high price charged for gas is liable to extinguish countless small industrial enterprises and poor households, just as much as if a special tax on gas were imposed. As soon as it is clearly recognized that in the general interest a local authority must not make a large profit on its undertakings, considerable light is thrown on the problem that is exciting so much attention—viz., the relative merits of private and state or municipal trading. In no other country are there such excellent Government and local officials as in Germany, Herr Körting believes; but, nevertheless, the great majority of German men of business are convinced that the prosperity of the country depends upon free play being given to individual effort and private trade. The gas industry is no longer simple, easy to superintend, conservative, and indolent. It is undergoing change and development as fast as any other business; and, if it is not to languish, it must adopt, on its technical side as well as in its treatment of consumers, the modern methods that private traders now employ.

The author therefore thinks it by no means impossible that in the future urban authorities will leave the supply of gas to private undertakings more readily than they have hitherto—more particularly so because the gigantic state and local borrowings have upset the Money Market, and the price of the safest investments is so extraordinarily low. Since the year 1900, the Government and local loans raised in Germany have amounted to nearly five thousand million marks (£250,000,000)—roughly two-thirds of which have been issued by the State, and one-third by local authorities. If some of this borrowed money could be transferred to the books of limited liability companies reckoning to pay 5 or 6 per cent., it would no doubt be very beneficial.

The present paper is not the place to express any definite judgment upon the political questions that have been raised; and the author must content himself with having indicated in what direction the conclusions may point which an intelligent student shall draw from the data he seeks in the periodical accounts of gas undertakings. It may perhaps be remarked that since the victory of the Liberals at the polls, public attention has been earnestly bestowed in England upon the results of municipal trading. At the last election of the London County Council, the heavy debt and the unremunerative character of numerous recent enterprises led to a definite pronouncement against Socialistic administration, and caused the former Progressive majority to be swept away. All the bearings of this problem have been ably discussed by Lord Avebury in his admirable book "On National and Municipal Trading." The distinguished British economist expresses the same wish as the present writer—viz., that the accounts of large undertakings should be published in a uniform and perfectly intelligible fashion; but he goes a step farther, and holds that the municipal books should be regularly examined by a Government audit department.

EVOLUTION OF THE INVERTED GAS-LIGHT.

(*Concluded from p.* 731.)

Simple and effective arrangements for gently warming the primary air and supplying it to the injectors uncontaminated with combustion products, are utilized in the out-door inverted lamp constructed by Reiss, of Berlin. The main structure of the burner is a hollow cylinder with a slightly widened mouth at the base and a domed cap at the top. This cylinder is divided longitudinally into two segments and a central portion by two plane vertical partitions. The segments are the chimney for the waste gases, and are open top and bottom. The central space is closed both ends, but has a set of holes in its walls near the base, through which the primary air enters, and a further set of holes near the top, from which the excess of air escapes into the chimney. The gas-supply pipe passes through the top of the central space, and subdivides within it into the desired number of injectors and mixing-tubes, which latter pass air-tight through the base. Hence only short ends of the mixing-tubes are directly exposed to the heat of the flames; while their upper parts and the nipples are kept moderately cool by the excess of fresh air entering through the lower holes already mentioned.

In order that the injection chambers and the nipples may be accessible for cleaning and adjustment, sliding or hinged doors are provided in the walls of the main casing. The secondary air enters under the reflector, and impinges against the lower part of the chimney before arriving at the mantles. A very similar device is met with in the Ehrich and Grätz lamp; but the common gas-supply pipe is branched higher up in the main casing, and each mixing-tube has its own cylinder subdivided in the manner already described. The primary air inlets lie under a protecting collar on the outside casing at a level with the injectors. A lamp of the latter description, fitted with a 22-inch reflector, and consuming on an average 11 cubic feet of gas per hour, at a pressure of 15·7-10ths, will give a mean spherical illuminating power of 220, and a mean lower hemispherical illuminating value of 364 candle power; the maximum light emission being at a depending angle of 60°, and the duty evolved rising for a time as the mantles remain in use.

In the excellent intensified multiple inverted street lamps made by the Auer Company of Berlin, the mixing-tubes are arranged inside a similarly conceived insulating chamber, which is disposed as an annulus round the central chimney. The annulus is closed top and bottom; but it has inlets for primary air at its lower outside edge. By this system of construction the outermost walls of the lamp are kept cool, and but little heat reaches the glassware. Thus fractures are not likely to be frequent. The injectors are rendered accessible through swing doors in the outer casing. The mantles are provided with one common or several individual cylindrical inner globes; and a pilot-flame tube passes down through the chimney space. In later models, the annular chambers round the mixing-tubes are made shorter, and are so constructed as to slide up the central chimney above the level of the injectors for cleaning purposes. Thus the burner-tubes can be reached without difficulty, by merely raising the lower casing. The gas-supply pipes and the pilot connection are altogether outside the chimney. The pilot flame burns in the base of the air-chamber; ignition being brought about through a hole in the partition underneath. The chimney suction draws away the combustion products from the pilot, and so prevents the primary air from being appreciably contaminated.

An elegantly designed street-lamp has been brought out by the Kölner Eisenwerke, of Cologne. The lamp is carried on an inverted stirrup, one arm of which is the gas supply. The cock, regulator, and injector are situated at the top of this arm; a horizontal tube containing the nipple leading the mixture of gas and primary air to a concentric spot, where it turns downwards and subdivides into the desired number of burners. The horizontal mixing-tube lies within a jacket composed of the reflector and the hood. A short vertical cylindrical casing round the mantles is carried by a system of levers so as to be movable and to thus serve two purposes. When the globe under the lights is fastened up in its usual position, the casing is above the mantles, and acts merely as the chimney for the combustion products; but when the globe is lowered on its hinge for cleaning, &c., the casing automatically descends below the mantles, and protects them from wind and rain.

Our contemporary "Engineering Record" points out that water-softening reactions are notoriously delicate—a fact which has been emphasized by the experience with the softening method at Oberlin, Ohio. By the process of softening followed there, the water is treated in two settling-basins. During last August it was discovered that if all the chemicals for the day were put into one-half of the water, and the other half was allowed to flow into the first basin without chemicals, there would be no caustic alkalinity in the water after mingling and treatment, and the magnesium would be reduced from 22 to 1·5 parts per million. It had previously been impracticable to remove so much magnesium, as the caustic alkalinity would rise too high.

GERMAN ASSOCIATION OF GAS AND WATER ENGINEERS.

FORTY-SEVENTH ANNUAL MEETING.—MANNHEIM, June 11 to 15, 1907.

REVIEW OF THE PROCEEDINGS.

[From Our Own Correspondent.]

Mannheim has a population of nearly 170,000, and is the largest town in the Grand Duchy of Baden. On the opposite bank of the Rhine lies Ludwigshafen. Together these two towns number 250,000 inhabitants. At the time of writing, however, there is not a bedroom available for the casual visitor in any of the hotels or lodging-houses in either town, so great has been the influx of gas and water engineers and their friends who are attending the annual meeting of their German technical association. It is true that an Exhibition of Art and Horticulture is open at Mannheim, and that it must have attracted a certain number of visitors to the town; but, on the other hand, the tourist season has not yet fairly commenced. The pressure on the hotel and lodging accommodation may therefore be ascribed almost wholly to the meeting of gas and water engineers; and, having regard to the size and capacity in that respect of Mannheim and Ludwigshafen, it affords strong testimony to the zeal with which these engineers participate in their annual foregathering. Like many of the older German towns, Mannheim is essentially modern, for the later growth has completely overshadowed the old. It is one of the few European cities which has adopted, in so far as the inner town is concerned, the American system of indicating streets by letters and numbers instead of names; and the streets have been planned in two sets of parallel lines at right angles to one another, in accordance with the American ideal. Outside the inner town, however, they are less regularly disposed, and are named.

Mannheim and its Industries.

Mannheim has attained to the position of the leading city of Baden mainly in virtue of the industrial efforts of its inhabitants, though the far-seeing policy of those who a century ago planned the diversion of the Rhine, which made that river navigable and prevented the disastrous inundations and epidemics of malaria and ague which formerly prevailed, has also helped it to its present pre-eminence. To those interested in the gas industry, perhaps the most significant feature of the industrial supremacy of the locality is the works of the world-renowned *Badische Anilin und Sodafabrik* (the Baden Aniline and Soda Works) at Ludwigshafen, of which the workers and their families suffice in themselves to furnish population for a moderate-sized town. The works are said to find employment for no fewer than 720 officials and 8000 workpeople; and rumour says that some 1500 out of this total have been trained as chemists prior to their admission to the works. Whatever may be the verdict as to the utility of this training to the individual, there is little question the Company who employ the trained chemists profit greatly thereby.

In large measure, Herr Bruno, the present Managing-Director of the undertaking, is responsible for the immense development of the aniline dye industry in Baden; and it is to his acumen in availing himself forthwith of the advances in chemical knowledge as applied to coal-tar colours that the present leading position of the colour-works at Ludwigshafen is due. Germany is incapable of furnishing the quantity of raw material needed by this and other German coal-tar colour-works; and a great part of it is drawn from England, which, needless to say, is also the best purchaser of the products. The colour industry is now so firmly established in Ludwigshafen and a few other centres in Germany that it seems hopeless to look for a re-transference of any considerable portion of it to England; but it is somewhat humiliating now to the English visitor to Baden to witness the development in a foreign land of an industry of which the founder (Perkin) was an Englishman, and which has, to all intents and purposes, renounced the country of its origin.

The members of the German Association of Gas and Water Engineers had on Wednesday afternoon last an excellent opportunity of viewing the general industrial development of Mannheim and the vicinity by means of a drive through the appropriately named "Industriestrasse," which is lined on both sides with works of very considerable magnitude, to the "Industrie" wharves, which are established on the former course of the Rhine. Thence the party was conveyed by special steamers to the confluence with the present course of the Rhine below Mannheim, and, turning there, was taken back up to the main stream, flanked on either side by the factories of Ludwigshafen and Mannheim, to the bridge in the residential quarter. The factories represent many industries, but especially those of chemical origin.

Apart from the Baden Aniline and Soda Works, however, perhaps the most lasting impression conveyed by the journey past the wharves on the Rhine was the magnitude of the warehouses, which here are said to be capable of storing twice as much imported goods as those of all the rest of Germany. The petroleum tanks of the German-American Oil Company are a very prominent feature of the prospect, and from the æsthetic standpoint are scarcely less pleasing than the many shafts belching forth smoke of a density and hue which would be considered discreditable even in Sheffield. There should be scope for the operations of a Smoke Abatement League in the neighbourhood of Mannheim. The factories, however, are located in the outer ring; and the residential and business quarters are not yet much affected by the smoke nuisance. If, however, works continue to spring up in the vicinity at the rate at which they have arisen during the last twenty or thirty years, even Central Mannheim will be greatly afflicted, unless some restraint is exercised in regard to smoky factory chimneys. Incidentally, it may be remarked that the presence of much smoke in the chimney gases is not necessarily an indication of the wasteful working from the point of view of the owner of a factory, since the excess of air essential to the maintenance of smokeless combustion means frequently a greater loss of heat. The owners of factories addicted to smoky chimney gases are not always blind to their own interests, as is frequently supposed; but they may legitimately be asked to amend their practices in the interest of public hygiene. Smokeless fuel, however, sometimes poisons the atmosphere with carbonic oxide, which is a more insidious and potent poison than the soot and hydrocarbons which constitute smoke.

Hospitality of the Mannheim Corporation.

The meeting opened on the evening of Tuesday, the 11th inst., when a reception of members and visitors took place in the hall of the Friedrichspark, followed by a supper and concert provided by the Corporation of Mannheim. As is usual on these occasions, great conviviality prevailed, and the company later adjourned to the open-air restaurant in the Park, which was specially illuminated in honour of the visitors. The temperature fortunately admitted of the enjoyment of open-air festivities, and proved a welcome change for those who had the day previously been suffering under the disagreeable climatic conditions which have prevailed in England and the more westerly parts of the Continent for some weeks past. In regard to the gathering itself, all praise must be accorded to the municipal authorities for their lavish hospitality. The participants separated at a late hour with mutual promises of more serious work the following morning.

The Meeting-Room.

The technical proceedings opened at nine o'clock on Wednesday morning in the large concert-room of the "Rosengarten." The building which goes by this name was erected in 1899-1903, to the designs of Professor Bruno Schmidt; and it is reputed to be the finest hall in Germany for festivities and entertainments. The stone and marble used in its construction and decoration certainly give a pleasing and soothing impression; and the ornamental work is in excellent harmony with the structure. The magnificent entrance hall was partially utilized on this occasion for an exhibition of gas plant and apparatus, of which more will be said later on. Fine marble staircases lead to the concert-room, which is upwards of 150 feet long, 62 feet wide, and about 50 feet high; and it can comfortably seat about 1200 people. On the first morning of the meeting, the room seemed to be nearly two-thirds filled. This is not, however, the largest room in the "Rosengarten," for the "Nibelungensaal," on the ground floor, in which the banquet was held on Friday evening, is 154 feet by 142 feet, and will seat about 5000 people. It is reported to be the largest concert-room in Germany, and it has excellent acoustic qualities. The members of the German Association of Gas and Water Engineers are always singularly happy in the choice of a suitable building for their annual meeting; but they have never had more ample and satisfactory accommodation than this year at Mannheim.

Welcome to the Association.

The meeting opened with the customary exchange of compliments between the President of the Association and the State and civic authorities. On behalf of the Grand Duchy of Baden, Chief Councillor Dr. Schneider, of Carlsruhe, welcomed the Association, and spoke of the good work which it was accomplishing through its experimental and instructional gas-works in that town. Then Dr. Beck, the Burgomaster of Mannheim, expressed the gratification of the municipal authorities at the selection of the town for the meeting. He referred to the industrial and technical progress of Germany during the last half century. At the time of the Great Exhibition of 1851 in London, German industry and art were unrecognized abroad; but now, through the association of science with technics, a great change had been effected. Mannheim was appreciative of the engineers and other technical men who had been instrumental in making the change, and welcomed the gas and water men on this account. He believed that municipal enterprise had been highly beneficial to the public, in that it had admitted of gas-works being equipped with the latest plant, for which private capital would not have been forthcoming in Germany. There

was no doubt that only thus would such public services have been properly performed in most towns, as private enterprise had been lacking; and it was only during the last decade that objection had been raised to these services being financed by the municipalities instead of by private companies. The water, gas, and electricity supplies of Mannheim were all in the hands of the Corporation. Dr. Arnold, of Carlsruhe, next welcomed the Association in the name of the Technical College in that city. Then Dr. Raschigs, of Ludwigshafen, spoke on behalf of the Mannheim-Ludwigshafen District Association of German Chemists, and of the Electro-Technical Association; and Herr Nettel on behalf of the local branch of the Association of German Engineers and the Baden Architects and Engineers. The President of the Association (Herr Nolte, of Berlin) thanked the speakers for their words of welcome, and congratulated Mannheim on the attainment of the 300th year of its existence—for it reckons its civic history from the year 1606, when the Elector Frederick IV. of the Palatinate is said to have established it.

President's Opening Address.

The President, Herr Nolte, who is General Manager of the New Gas Company of Berlin, then delivered a short opening Address, in which he referred to the progress of the Association during the past year; basing his remarks on the report of the Council, which was before the members. It was especially a matter for congratulation that the Association's experimental and instructional gas-works at Carlsruhe had been completed, and were being conducted successfully with the active co-operation of the authorities of the grand duchy, of the town, and of the technical college. Some fruits of the work expended would be found displayed in the report of the Committee who had charge of the undertaking, and in a communication on the "Chemical Composition and Calorific Value of German Gas Coals" which was to be presented in connection with that report. The Association had given active support to the German Museum of Master Inventions in Science and Art at Munich, and through a Special Committee had already furnished it with an interesting collection of notable apparatus from the gas and water industries. A catalogue of this collection had been prepared and printed. The Imperial Physical Technical Institute at Charlottenburg, and the Standards Committee, had co-operated with the Association during the past year to good purpose. Thanks to the photometric comparisons of the Hefner, Harcourt, and Carcel standards of light, which had been carried out at the Charlottenburg Institute, and also in Paris and London, it was expected that a general agreement as to the relative values of these standards would be arrived at at the International Photometric Congress which was to take place at Zürich next month. A Committee appointed jointly by the Association and the Union of Electricity Works had been formed to settle a basis for the photometry of electric arc lamps and inverted gas-lights. The work accomplished by the Committee, under the chairmanship of Mr. Lindley, of Frankfort-on-the-Maine, in the investigation of the electrolysis of gas and water mains, was very satisfactory, as would appear from the report to be presented to the meeting. The other technical Committees of the Association had also accomplished good work during the year.

Herr L. Körting, the Manager of the Hanover works of the Imperial Continental Gas Association, and President of the last annual meeting, had been nominated as an honorary member of the German Association. The membership of the Association had increased by 22 during the year, and now stood at 1024. Of this total, two were honorary members (one—Herr Körting—having been elected during the year), 848 ordinary members, and 174 associates. Among the losses which the Association had sustained by death during the year, special regret was felt for the late Herr E. Grahn, who had been one of the most active water engineers in the Association. Those present rose from their seats as the names of Herr Grahn and other deceased members were read out by the President, according to the German customary method of expressing respect for the departed.

The Gas, Water, and Electricity Works of Mannheim.

The President then called upon Herr Pichler, the Manager of the Gas, Water, and Electricity Works of the Mannheim Corporation, to give an account of these works, which he did as briefly as possible, as a printed description of them by him had been handed round previously. The substance of Herr Pichler's paper, in so far as it refers to the gas undertaking of Mannheim, is given on another page of to-day's "JOURNAL." Diagrams were exhibited showing the output of the three works year by year since their establishment, and the growth of the population of the town. In 1890, the gas sold amounted to nearly 210 million cubic feet; and in 1895 to somewhat over that quantity. There were then fairly rapid annual increases to about 350 million cubic feet in 1901. Then came two quiet years, followed by a steadily rising output to a total of over 400 million cubic feet last year. A capital of about 16½ million marks has been laid out on the gas, water, and electricity works up to the present time; and last year a net profit of over 1,000,000 marks (£50,000) was obtained from them by the Municipality.

Vertical Retorts and Other New Carbonizing Chambers.

Then followed a series of communications on vertical retorts and other new carbonizing chambers, of which unfortunately the time available did not admit of presentation in full, or of adequate discussion. The first was an account by Herr Preuger, the Manager of the Cologne gas undertaking, of the large installation of vertical retorts on the Dessau system at the Ehrenfeld works at Cologne. This installation is quite new, and is the largest yet erected. It is on much the same lines as the installation of vertical retorts at the Oberspree works at Berlin, of which some particulars appear on another page of to-day's "JOURNAL." The vertical retort-house at Cologne, however, contains no fewer than 240 retorts, arranged in two pairs of benches. Each bench comprises six beds, each containing ten retorts disposed in pairs. The retorts are about 18 feet in length. Carbonizing commenced in about half the installation some ten days ago; and the rest of the beds are now being put under slow fire. We hope next week to be able to give a personal impression of the working of this unique installation, together with some further details of the plant.

The next paper was by Mr. E. Körting, the Manager of the works of the Imperial Continental Gas Association in Berlin. It described the retort-house for the vertical retort installation at the Oberspree works at Berlin, already referred to. In regard to the Dessau system of vertical retorts, Herr Preuger made the remark that, though a section of gas engineers still avoided them and regarded them with distrust, it could be considered as established that these settings were satisfactory, and constituted a distinct advance in gas manufacture. They were a triumph for the gas industry of Germany. Mr. Körting said that precise trials at Oberspree on the productive efficiency of vertical retorts had given very satisfactory results. In May, the small vertical retort installation had done much better financially than the rest of the plant at Berlin. Dr. Bueb, the inventor of the Dessau system, followed with a few remarks to the effect that the results of the installations generally had been very satisfactory.

Herr Ries, the Manager of the Munich Gas-Works, then read a paper on a type of large carbonizing chambers which have been in use at those works for over a year. These chambers are of considerable size—viz., 13·1 ft. by 5·9 ft. by 1·64 ft., and are inclined, so that they are charged from one end and discharged from the other, as ordinary inclined retorts. The upper end is, however, nearly closed by fire-brick, and a special charging dome is provided in the upper part of the chamber at this end, into which the shoot of the charging hopper enters instead of into the retort itself. The producer stands in front of the setting beneath the charging floor. The gas-exit pipe is from the upper end of the chamber; and the gas passes by a dip-pipe into a hydraulic main above the bench, and thence into an overhead foul-gas main. The coke falls into a large receiving channel on the ground level outside the house in which the bench and charging stage are enclosed. From this channel, it is picked up by skips carried by an overhead framing, and conveyed to an adjacent store yard or to waggons, as required. Among the advantages claimed for this carbonizing chamber is economy of labour as compared with any system of continuous carbonizing. This economy arises mainly from the chamber being charged only once in 24 hours. Herr Ries estimated that his chamber required only three to four men to attend to them, each doing only eight hours work; while for the same make under continuous working twenty to thirty men were required, even with day and night shifts. The carbonizing chambers did not need even the attendance of a watchman at night. There was with them less severe radiation of heat and less evolution of smoke, so that hygienically they constituted a great advance. The Munich installation comprised five settings, each containing three chambers; and an exhaustive investigation of their working had been made by the staff of the Association's new experimental and instructional gas-works. It appeared from the results of this investigation that the carbonizing efficiency of the chambers was very good. The following is a summary of the results attained in the trials; the coal carbonized being Saar, from the Heinitz-Dechen pits.

Three Settings, each containing Three Carbonizing Chambers, were in Action.	Single Day's Trial Feb. 7-8, 1907.	Continuous Work from Feb. 7 to 16, 1907.
Average charge per chamber	5,540 lbs.	6,190 lbs.
Make per ton—		
Uncorrected	12,200 cubic feet	11,784 cubic feet
Corrected to 0° C and 760 mm.	11,131 ,,	10,733 ,,
Gas—		
Mean specific gravity	..	0·40
,, illuminating power in slit burner at the rate of 150 litres (5·3 cb. ft.) per hour	..	11·88 Hefners = 10·8 candles.
,, calorific power, gross	..	662 B.Th.U.
,, ,, ,, net	..	596 ,,
Mean temperature of chambers	..	1,250° C.
Coke (dry) obtained per cent. by weight of coal	67·88	66·77
Consisting of—		
Large	63·51	61·57
Medium and small	2·80	3·40
Breeze	1·57	1·79
Condensed products (total per cent.)	13·63	13·44
Consisting of—		
Tar	6·19	6·14
Liquor	7·44	7·30
Ammonia recovered (per cent. by weight)	0·239	..
Coke (dry) consumed in furnace (per cent. by weight of coal carbonized)	..	15·32
Water evaporated in producer (do.)	..	13·25

At the conclusion of Herr Ries's paper, Professor Bunte expressed his gratification at the proof of confidence in the Association's experimental and instructional gas-works which the Munich gas administration had given in allowing it to undertake the investigation in question. The Carlsruhe Institution had carried out its task very satisfactorily. In regard to the performances of the vertical retorts and large chambers, ideas of the phenomena of the destructive distillation of coal had been considerably broadened and fixed by the work which these carbonizers had achieved. Their eyes had, he said, been opened in regard to the obstacles which formerly stood in the way of the development of the industry. Until a short time ago, no one ventured to believe that it was possible to obtain a proper make and quality of gas except by carbonization in small chambers. The idea that a more rapid change of temperature would follow with larger units had been shown by the trials to be groundless. Moreover, ideas had changed very much as to the quality of the gas which had to be distributed. Thanks to the incandescent mantle, it was no longer necessary to exceed a certain illuminating power. A gas of high candle power in a flat-flame burner or argand was a mere luxury. As to continuous carbonization in comparison with the chamber settings, he considered that the latter were decidedly to be preferred, both on account of trustworthiness in operation and economy of apparatus. Satisfactory continuous working must be regarded as an unattainable ideal.

English Gas Coal in Germany.

Herr Möllers, of Cologne, then read a paper on the "Use of English Gas Coals in Germany." His treatment of the subject only indirectly raised points of interest to English gas managers. He showed, by reference to statistics, the development of the importation of English gas coals into Germany, and the relation of their price to that of the competing German coal. He then reviewed the existing difficulties in the supply of coal from the German mines, and discussed when and where in Germany it was advisable to buy English coal for gas making. England would not in this matter submit to being used as a stop-gap without feathering her nest incidentally. But for regular customers she would quote low prices. The German gas-works ought not to compete against one another as buyers; they should combine and form a coal purchasing syndicate. They would soon find common ground; and the economic gas-works "combine" in Cologne had already bought English coal. The German coal mines were, however, giving attention to the matter; and their attitude towards the German gas-works had already in consequence changed considerably in the course of the year. The latter were no longer charitable institutions for the body politic, for their revenue balance formed an important item in relieving the pressure of taxation. The coal mines had no better regular customers than the gas-works; and the latter, therefore, were in a preferential position. For national and political reasons, it was desirable that good German money should remain in the country,

The significance of Herr Möller's paper may be realized by consideration of his position as Manager of the Economic Association of German Gas-Works in the Rhine District, Westphalia, and South-West Germany. This is an Association, founded about 1900, of the smaller German gas undertakings in the Provinces named, with a view to the purchase of coal in bulk direct from the producers, who had refused to supply small gas-works individually. Thus these small works had been formerly compelled to buy their coals through middlemen, and so pay an extra price for them. The Association had also endeavoured to restrain the action of the German Coal Syndicate in forcing up prices, and with this object in view had latterly been buying English and other foreign coal. The German Syndicate had retaliated by attempting with some success to corner the available supplies of imported coal. In its fight with the coal owners, the Rhenish-Westphalian Association had acted in co-operation with three similar Associations, representing respectively the gas-works of Berlin and neighbourhood, Bavaria, and Saxony. The price of German coal has been maintained at a high level—apart from the machinations of the Coal Syndicate—through the insufficient supply of waggons on the railway system, which is in the hands of the State. It had frequently been impossible, for this reason, to get coal away from the pits until several months after it had been raised, notwithstanding peremptory demands for its distribution.

Distance Lighting of Inverted Burners.

The last paper read on Wednesday was one by Herr Kern, of Strasburg, on "Inverted Gas-Burners with Devices for Ignition from a Distance suitable for Private and Public Use." The author reviewed generally the various methods brought forward to solve this question, and pronounced in favour of a number of them being perfectly practicable. In the course of next year, he expected that there would be a full list of competent devices. This paper concluded the technical proceedings for the day.

Visits.

In the afternoon a trip was made in steamers past the wharves of the district. Reference has already been made to the impressions which this trip created. In the evening, the members of the Association attended a gala performance of "Oberon" in the National Theatre in Mannheim, and were much impressed with the scenic effects and stage manipulation for which this theatre is famed throughout Germany.

Thursday morning was occupied wholly with the reading and discussion of papers on water supply, an account of which must be deferred. In the afternoon, a visit was paid to the Luzenberg Gas-Works of the Mannheim Corporation. It is unnecessary to refer to this visit in detail, as a description of the works is, as already mentioned, to be found elsewhere in to-day's "JOURNAL." It may be remarked, however, that machinery is extensively employed in and about the retort-house, as is now commonly the case with municipal gas-works in Germany.

The supply of this machinery seems to be in the hands of a very few firms; and there is little variation in the equipment of different works of similar size. The designs are those of the engineers of the contractors; and the works manager has merely the gratification of wrestling with the manipulation of the machinery which has thus been put into his hands. Herr Pichler, of Mannheim, being a capable Gas Manager, has succeeded better that many of his colleagues on other works in using the retort-house machinery to good purpose; but even in this case, it did not appear that the extensive application of more or less appropriate machinery had been quite justified by the result. The inclined retorts were very unevenly heated, despite the guidance afforded by an optical pyrometer (!); and some charges were being drawn in a semi-carbonized state, while others were heated to a degree which must spell early destruction or injury to the settings. There was much thick tar or pitch at the lower mouthpieces. The coke showed no disposition to slide from the retorts; and the drawing was as lengthy and trying a process as with any modern horizontal retorts. The coke was being removed by a Bamag-Marshall conveyor, which seemed in good working condition. It transpired, however, that it had only been in use for six weeks. The coke-screening and handling plant was on a comprehensive scale, as is commonly the case in Continental gas-works, where there seems always to be a demand for coke carefully sorted in various sizes. The impression afforded by the visit to the gas-works was that the outlay on mechanical plant was greater than the requirements of the works justified.

On returning from the gas-works, the evening was spent in the Exhibition of Art and Horticulture, which was exceptionally illuminated for the occasion. It was noteworthy that carefully drilled steatite nipples were used in all the decorative gas-lighted designs; and the uniform size of the gas-jets so obtained made the effect better than is general where steatite nipples are not employed.

Further Gas Papers.

Friday morning was devoted to more papers on gas matters. They included one by Herr E. Körting, of Berlin, on the "Calculation of the Prime Cost of Gas," of which an abstract translation is given on another page of to-day's "JOURNAL;" and one by Herr Kobbert, of Konigsberg, in Prussia, on "Questions for Gas-Works and their Solution." Professor H. Bunte, of Carlsruhe, gave an interesting address on the "Phenomena of Combustion with Inverted Gas-Burners." Dr. Schütte, the Manager of the Bremen Gas-Works, had a paper dealing with the "Supply of Germany with Carburetting Oils," which had no special points of interest to English gas managers, who have not to consider the effect of a heavy import duty (amounting in Germany to about 3s. 6d. per cwt., with, in the case of large works, a possible reduction to about 1s. 6d. per cwt.) in selecting the source of supply of the gas oil which they require. Dr. Becker, of Frankfort-on-the-Maine, related, under pressure of time, his experiences with the De Brouwer charging and discharging machines; and the meeting then proceeded to take the reports of the Technical Committees, and to transact private business.

It was decided to hold next year's meeting in Berlin.

Concluding Functions.

On Friday afternoon, a visit was paid to the Mannheim Water-Works, and in the evening there was a banquet in the Nibelungensaal of the Rosengarten, concluding with the presentation, by an excellent company of artistes, of an allegorical piece, in verse, illustrating the development of lighting and water supplies. The performance concluded with a dance by the artistes. The Friedrichsplatz, in front of the Rosengarten and Exhibition, was specially illuminated as the company separated about midnight.

There were 1021 persons taking part in the year's meeting, of which number 870 were of the male sex. Saturday morning was allotted to a visit to the Exhibition, though a strenuous minority went to Carlsruhe to inspect the Association's instructional and experimental gas-works, and the No. II. gas-works of that town. All met in the afternoon at Heidelberg for a visit to the castle, an excursion on the Neckar, and a convivial gathering in the town hall. Thus ended a memorable and highly successful gathering, of which some further particulars will be given later in the "JOURNAL."

A well-boring apparatus of unusual construction is now attracting some attention in Germany. It consists of a shell, of the diameter of the well to be bored, which is made to rise and fall by means of a pair of hydraulic cylinders, with some special devices, attached to the end of a hollow rod suspended in the well. When a hydraulic pressure of about 140 lbs. per square inch is transmitted down the hollow rod, the shell is made to rise and fall at the rate of something like 50 or 60 complete strokes per minute.

REPORTS OF THE COMMISSIONS APPOINTED BY THE GERMAN ASSOCIATION.

I.—THE PHOTOMETRY COMMISSION.

In the first pages of the report submitted by the Photometry Commission to the German Association of Gas and Water Engineers at their Mannheim meeting, an account is given of the preliminary stages of a negotiation with the Association of German Electricians ("Elektrotechniker") relative to the adoption of some standard rules for determining the illuminating power of large units of light, such as electric arcs, inverted, and, more particularly, intensified gas-burners. The Gas Commission appointed Dr. Bunte, Professor Drehschmidt, and Dr. Krüss to represent them, and a meeting was held at Halle in March.

It may be remembered that the Association of German Electricians and the Association of Electricity Works ("Vereinigung der Elektrizitätswerkë") decided in 1905 that some rules for measuring the illumination afforded by arcs were called for, presented a code to their meeting in 1906, and made arrangements to revise it after one year's experience. The rules stated that the light yielded should be returned in mean lower hemispherical Hefners, and that the arcs should be tested within clear glass globes, as ground glass caused absorption of the light and affected its distribution. The adoption of the last rule leads to results being obtained which do not agree with those found under practical conditions—especially in the matter of distribution. It was also agreed that the illuminating power should be deduced from a mean polar curve with measurements at every 10 degrees, by the method of integration, or preferably with the aid of an Ulbricht sphere. The latter is a hollow globe painted white inside, with an aperture at the top for the insertion of the lamp, and with a window of opal glass at the side protected from the direct rays of light. The light suffers diffuse reflection at the walls of the globe, and the illumination issuing from the window is measured in the usual fashion. A large sphere is necessary, in order that the shadows cast by the opaque portions of the lamp may occupy but a comparatively small space.

The Commission of the Gas Association felt that such an apparatus as this must require modification before being fit for use with sources of light that consume much oxygen. The members also considered that a good deal of the light emitted by a powerful gas unit, like an intensified incandescent, issues in an upward direction, but is subsequently reflected and made useful for downward illumination. Hence the value of such a source cannot be judged from the lower hemispherical illuminating power alone, as is the case with an electric arc. Nevertheless the members thought that, in view of the competition between the two industries, some understanding upon the subject of applied photometry should at least be sought.

A joint meeting of the Commission and the Association of German Electricians accordingly took place a few days before the Mannheim meeting; and as a result it is hoped that some agreement will be arrived at whereby a better method of determining the amount of light afforded by any particular source may be elaborated than the plan now adopted of measuring in a horizontal, or one special, direction only. Should this be effected, it will become possible to calculate the relationship of the total light emitted to the quantity of gaseous, liquid, or solid fuel burnt, or to compare it with the amount of energy consumed in any electric light.

Other Matters.

Previous reports of the Photometry Commission have dealt with the effect produced upon the light of an incandescent burner by an addition to the coal gas of carburetted or blue water gas. The Commission have decided not to proceed further with the matter at present, as the experimental laboratory of the Association at Karlsruhe is now in a position to undertake accurate investigations.

In last year's report* an investigation was described into the influence of long-distance transmission upon gas at different pressures. As the winter of 1905-6 was mild, the experiments at low temperatures were repeated last season during a period of severe frost. The results of the research have been collected, and will be published separately.

No meeting of the International Committee on Photometry was held during the twelvemonth under review; but one is to take place at Zurich this July. In the meantime, the reports of the English, French, and German investigations into the comparative value of the three standards have been issued; and Dr. Krüss has been requested by the Committee to prepare a report upon the subject.

A revision has been made by desire in the regulations for the photometric examination of incandescent gas-burners, more especially with reference to inverted burners. It would be advantageous if experiments with the latter were carried out in the Ulbricht sphere.

II.—THE HEATING COMMISSION.

The report of the Heating Commission opens with a further reference to the agreement reached between the Association and Privy Councillor Rietschel on the subject of the proper method of constructing, erecting, and using gas-heating apparatus. The rules drawn up were printed a short time ago in the "Journal für Gasbeleuchtung," and have been published as a pamphlet, so that they are procurable from the booksellers.

The Commission took part, on behalf of the gas industry, in the exhibition of hygienic apparatus held last autumn in the "Wandelhalle" of the Reichstag building in Berlin, showing, so far as the limited space at disposal allowed, a small collection of gas-heating apparatus, together with models, diagrams, statistical tables, and appropriate literature.

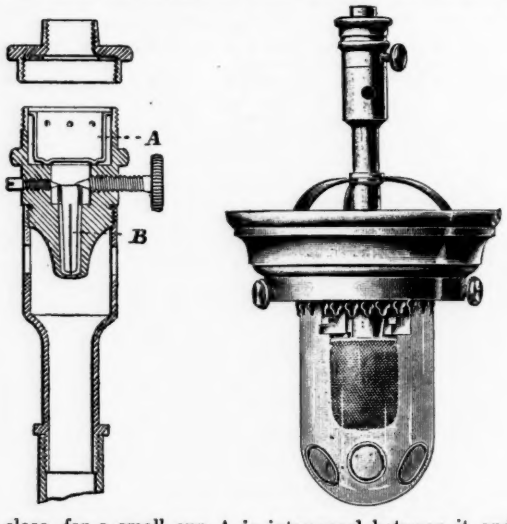
A motion was brought forward during the past year by Herr Kern, of Strasburg, that the Commission, or the Association itself, should issue standard rules for gas-fitters; but the idea did not prove acceptable to the members. It was felt that the Association ought not to countenance the excessive eagerness with which Government officials in Germany are attempting to shackle the spontaneous development of industrial enterprise by means of regulations overloaded with detail; and therefore the Commission thought it undesirable to attempt a code of rules controlling the every action of a workman when erecting lighting or heating apparatus for employment with gas. To whatever extent they are not already in existence, regulations of this kind should be drawn up in each town in accordance with the circumstances there prevailing. On the other hand, in view of the technical developments and new conditions that have arisen of late in the gas industry, the Heating Commission have decided that the time has come for a revision of the rules already in existence which relate to the manner of carrying out private gas installations; and this work will be put in hand at once.

A campaign against the use of gas for heating churches has been opened by one of the German technical papers; and the Commission have found it necessary to refute the arguments employed.

* See "Journal," Vol. XCV., p. 100.

THE "S. N." INVERTED BURNER.

At the Congress of the Société Technique, M. Dorigny described an inverted burner introduced by the Société Nationale d'Incandescence. It works at the low pressure of 22 mm. (9-10ths); and as its lighting is not affected by variations amounting to 8 mm. or 10 mm., it may be adjusted to the lowest pressures. The burner is shown in the accompanying illustrations. The ejector does



not close, for a small cup A is interposed between it and its screw-thread, and this retains all the impurities the gas carries with it. The ejector consists simply of a small hollow cylinder in the form of a cross, which is attached to a cone by means of a set-screw. The hollow portion contracts and allows less gas to pass. The screw is adjusted until the most perfect action of the mantle is obtained.

The burner is supplied with a smoke consumer (concealed by the gallery), which conveys all the burnt gases to one side of the apparatus, and thus facilitates the use of the adjusting screw. Moreover, the gases being discharged at the side remote from the ornamental fittings of the burner, the latter are safeguarded from oxidation. The mantle is held by three clips, and is steady under conditions of vibration. The consumption varies from 90 to 100 litres (3 to 3·5 cubic feet) of gas per hour, according to the pressure, and the lighting power is 100 candles. The Société Nationale have produced a similar lamp on the same principle, with two, three, or four lights, for outdoor use. Its consumption is about 400 litres (14 cubic feet) per hour for a four-burner lamp, and its illuminating power is upwards of 450 candles. It can be placed in a high wind without risk of extinction, as the air current is broken up by a special form of construction, and cannot penetrate into the lamp.

Credit should have been given to the "Journal of the Society of Chemical Industry" for the translation of the paragraph entitled "New Intermediate Product from Thorium" that appeared in a recent number of the "Berichte," and which was reproduced in the "Journal" for June 4, p. 641.

SOCIÉTÉ TECHNIQUE DE L'INDUSTRIE DU GAZ EN FRANCE.

THE THIRTY-FOURTH ANNUAL CONGRESS.—Nancy, June 11 to 15, 1907.

REVIEW OF THE PROCEEDINGS.

[From Our Own Correspondent.]

About 220 miles direct east of Paris, and within 35 miles of the frontier between France and Germany, and within 100 miles of Strasburg, lies the bright, pleasant, and picturesque town of Nancy. It was the old capital of Lorraine, and is intimately connected with the Dukes of that name, the last of whom was the ex-King of Poland, Stanislaus Lesczinski, who died in 1766. His statue stands in the centre of the Place Stanislas—a fine open square with the Hôtel de Ville and other buildings of the Seventeenth Century, which, with tasteful iron grilles of 100 years later, give a beautiful harmonizing architectural effect. To-day, Nancy is the chief town of the Department of Meurthe and Moselle, and has just over 100,000 inhabitants. Its interests and industries are wide and numerous, as the varied visits of the Société Technique testify. Its University is famous; its School of Medicine has done remarkable work in neurotic cases by hypnotic suggestion; and its School of Forestry is the only one of its kind. Of its many manufactures, its macaroons must not be forgotten, besides which it has specialities of embroidery and art pottery, and large metallurgical works. Such, then, is the kind of town that was chosen as the meeting-place for the thirty-fourth annual congress of the French Gas Society. Twenty years before—in 1887—the fourteenth yearly meeting of the Société Technique was held here; and many members who attended then were again present at the gathering last week. This year's President, M. André Coze, is one of them; for reference to the volume of "Transactions" for 1887 shows that he then read a paper "On the Working of a Bed of Nine Inclined Retorts with Automatic Charging and Drawing." This paper was an enlargement of his first one on the subject of inclined retorts, which he read at the Bordeaux Congress in 1885. What changes and developments in carbonization have taken place since then!

Ordinary General Meeting.

It is 9.40 a.m.—ten minutes later than the scheduled time—when the President opens, by ringing a bell, the ordinary business meeting of members. There is a goodly gathering of about 100. On the high platform in the Salle Déglin, in the Rue de l'Equitation, are the members of the Committee and one or two Past-Presidents, and, of course, the ever-active Secretary, M. Payet. The hall in which we are gathered is a bare one, with something of the appearance of a warehouse—its white walls partially relieved by draping and flags surrounding monograms "R.F." It is very soon evident that the acoustic properties of the room are far from being what is desirable—in fact, it was frequently with considerable difficulty that some of the speakers could be heard. In the afternoon, acting on a suggestion of M. Cornuault (Past-President), the chairs were all moved closer in, so that the proceedings might be followed with some degree of comfort. The minutes of the meeting in Paris in 1906 are unanimously adopted. New members are now to be elected; and the list shows 36 names proposed as full members, and 10 as associates. There is also a note to the effect that, as the President of the Institution of Gas Engineers, Mr. Charles Hunt, is already a member of the Société Technique, there is no honorary member to be nominated this year. While the Scrutineers are engaged in their more or less formal task, M. Coze reads the Committee's yearly report.

The Committee's Report.

It is a longer document than usual, and contains some points of interest. There have been regrettable losses through death—one Past-President (M. Eugène Lebon), two honorary members (Mr. Charles Gandon and Mr. Samuel Stewart), and eleven others. Among these, is the name of William Thomas Sugg, to whom sympathetic reference is made. The report says: "The name of our colleague William Sugg is among those who, during especially the last quarter-of-a-century, have become authorities in matters of lighting, not only in England, but also throughout the whole gas world. It is the name of a worker, as intellgent as indefatigable, eager, patient, and sure. There are no questions relating to the domestic uses of coal gas that he has not touched or solved with success; and to call to mind his works is almost to mark the commercial phases of the gas industry among our colleagues on the other side of the Channel. It is also to mention one of the largest contributions which have been made to official photometry . . . . His friends and colleagues had for him the greatest esteem, and will long cherish the remembrance of his high qualities of heart and of intellect." Though not a member of the Société Technique, feeling reference is also made to the loss sustained through the recent death of M. Paul Gigot, of the Paris Gas Company.

The numbers of the French Gas Society, including the new members elected this year, are as follows: Honorary, 21; members, 553; associates, 119—total, 693. The report mentions that there are now occasions, more and more frequent, in which "*Union fait la force;*" and it refers to what was able to be done in September, 1906, in getting a representative vote on the question of the law as to a weekly holiday. The list of donations from gas companies is set out in the report; and the sum amounts to 25,475 frs., or £1019. This is given by 52 subscribers; so that there is an average contribution of nearly £20. What a contrast this regular yearly total of about £1000 affords to our English spasmodic "special effort" of about half the amount! The proposed International Gas Exhibition at Paris in 1909 is referred to. It is believed that "an exhibition at Paris, the centre of attractions, advertised by all possible means of popularizing it, even in straggling villages, ought to be greatly efficacious in developing and generalizing the use of our chief product, and should mark the beginning of a new effort in our industry."

The Committee have chosen, from among the many subjects submitted for discussion at the new "Séance de Discussion," one for competitive essays for next year. The subject is: "Methods of utilizing ammoniacal liquor in small and average-sized gas-works." This is selected as it is thought that it will direct attention to the needs in this respect of the many small works, "which are numerous in France, and which deserve our attention to the same extent as the large ones."

The establishing of some sort of Benevolent Fund is then dwelt upon in the report. It is proposed to divide it into two distinct parts; the first being a reserve fund, and the other a benefit or provident society. The idea is to encourage thrift; and the general guiding principle will be that "no one shall share in the harvest who has not personally contributed to the sowing." Among the objects will be to assist, in times of trouble, the payment of premiums, to make loans with or without security, to help in the instruction of members' children, and to aid their widows and orphans. "Who knows," the report concludes, "whether, by a generous start, you will not have contributed to save hereafter some unfortunate inventor from misery, or to secure an elementary education for some young gas students who may give a fresh impulse of prosperity to our industry." The ideas and expressions of the report are received with the warmest applause by the members.

The Treasurer's Report.

The next report to be taken is that recording the financial condition of the Society. The Treasurer, M. Marquisan, read the figures. The receipts for the year total up to 73,486 frs. (about £2939); the members' subscriptions amounting to 11,680 frs. (£467). On the other hand, the expenses reached 71,179 frs. (£2847); and among the items the following are particularly noticeable. On publications alone, the Society have spent no less than 11,033 frs. (£441), or about the whole amount received in the way of members' subscriptions; the library takes 2741 frs. (£110); and the prizes given have cost 9743 frs. (£390). At the end of the year 1905, the capital of the Société Technique was 203,464 frs. (about £8139); whereas at the expiration of 1906, it was 204,726 frs. (£8189)—showing the small, but satisfactory, increase of 1261 frs. (£50). The President expresses the thanks of the Society to M. Marquisan, and the report is adopted with applause.

The New Committee.

Before proceeding to the election of members to serve on the Committee, M. Coze refers in suitable and sympathetic phrase to the illness of M. Mariez, the Manager of the Nancy Gas Company. He wishes him speedy restoration to health; and his remarks meet with cordial support. There were five triennially retiring members of the Committee; but these were able to be re-elected, and they were. A sixth member to serve for two years was also to be elected in place of M. Coze, who passes now from the Committee to the rank of Past-President. The results of the voting, which was not nearly so keen as is usually the case, are as follows: MM. Boutan, Brouardel, Gaston Gautier, Kæuffer, and Villiers are re-elected; and the new member on the Committee is M. Delebecque, who replaces M. Coze. The composition of the "bureau" of the Society for the ensuing year is: President (for a second year), M. André Coze; Vice-President, M. Godinet; Hon. Secretaries, MM. Boutan and Gaston Gautier; Treasurer, M. Marquisan.

This concludes the business meeting of the Congress, and the President adjourns the proceedings till the afternoon.

Presidential Address.

The Congress proper was opened at 2 o'clock. The representative of the French Government, M. Dupré (the Secrétaire Général de la Préfecture), was present, as also was M. Beauchet,

the Mayor of Nancy. M. Coze briefly welcomed them in suitable words, and then proceeded to read his Presidential Address. As is known, by no means the same importance and significance are attached to this item of the programme in the French meetings as is the case with us at home. An English gas engineer would naturally expect to find in a presidential discourse a more or less exhaustive treatment of some topic with which the President was known to be particularly familiar, or else a general review of gas matters. At all events, in our eyes and ears it is anything but an insignificant part of an annual meeting. It is quite different, however, in France; and so M. Coze did not feel called upon to deliver any elaborate discourse. Inclined retorts and systems of carbonization are not touched upon at all. Instead of that, he deals principally with commercial methods of increasing the sales of coke, more particularly in small quantities. "The high price of coal, he says, is disquieting; and coke is always the only bye-product which can partly compensate for the loss suffered by the unceasing rise in coal." Then the difficulties of carrying on gas undertakings now are greater and more critical than ever. When concessions are renewed, the price of gas is decreased, and the conditions imposed are more onerous. "It is true that it is proposed to counteract this by modifying the equipment of gas-works by the introduction of mechanical appliances, and by the transformation of the retort systems; and also by the introduction of the manufacture of water gas, and the distribution of gas to a greater distance. But these several technical processes, good in themselves, only increase the amount of capital sunk. They cannot be generally adopted." It is to the profitable manipulation and selling of bye-products that one must turn; and this involves no contingent capital. Tar to-day is sold to distillers at an excessively low price. Ammoniacal liquor can produce various products; but in small works its treatment is still a problem to be solved. The working up of cyanides only applies to large works. Thus it is to coke that we must look for commercial development. "It is necessary to open up new markets, and to spread everywhere the use of coke." There is plenty of competition—charcoal, non-bituminous coal, anthracite, &c. "If we wish to dislodge our competitors from the positions they have taken, our goods must be irreproachable, from the point of view of their classification, of their regularity, their cleanliness, and their weight." All works ought to adopt as far as possible the same classification of coke.

M. Coze then proceeded to give an account of what he had done since the year 1895 to increase his coke sales. Coke in special paper bags and small quantities has been distributed among a number of retail shopkeepers—not usually associated with such sales—and thus the custom was cultivated and the business increased. Other figures and details of this coke service were given by the President; but they are more particularly of local interest. He concludes by saying "that we ought by all possible means to seek out customers for the consumption of coke, to increase the number by unceasing efforts, and, above all, always to arrange with colleagues, both near and far, so as to co-ordinate our methods of activity towards one object only—the prosperity of our industry." The address was warmly applauded by the large gathering of members.

Distribution of Awards.

M. Dupré, representing the Government, then distributed the official medals to those workmen and others to whom they had been awarded. In this task he was assisted by the Mayor, who presented the awards to the recipients native of Nancy. For the prize of 200 frs. (£8), given to foremen and workmen having the best and longest record of service in the same works or company, there were 100 candidates; but the resources of the Society only allowed 30 awards to be made. This report was read by M. Visinet; and the recipients, who ranged from 30 to 48 years of service, were cheered on receiving their well-merited rewards. M. Delahaye next read the report on the silver medal awards to employees, of whom there were 20 thus recompensed, having more than 25 years' work to their credit.

Following on this came the report, read by M. Godinet, on the prizes of 250 frs. (£10) for the best papers contributed to last year's Congress. First of all, in accordance with custom, the papers by members of the Committee (who cannot compete for the prizes) were analyzed and commented upon. M. Cabrier was awarded a prize for his paper on an automatic system of charging retorts. M. Casaubon received 250 frs. again this year, as last, for his interesting presentation of a method of calorimetry by ascertaining the exact amount of air necessary for complete chemical combustion. The Committee cordially congratulated M. Casaubon, and members echoed their agreement. M. Coudelou was given a prize for his paper setting forth comparative figures of the cost of cooking by gas and coal; and M. Despierre likewise for his account of repairs to a gasholder tank. It was with great satisfaction that the announcement was received that M. Payet, the able and active Secretary of the Société Technique, was not for this purpose to be regarded as a member of the Committee, but was awarded a prize of 250 frs. for his examination into the influence of gasholders on the quality of gas. Furthermore, he has obtained the special prize given by Madame Vve. Durand of a complete set of the "Constructeur d'Usines à Gaz. Lastly, Dr. Steger was awarded the usual amount for his paper on the Kramers and Aarts system of water gas. All these gentlemen were heartily applauded on stepping forward to receive the happy results of their achievements. [Translations of the papers named were given in the "JOURNAL" last year.]

After an adjournment of five minutes, a continuation was made with the reports; and M. Delahaye read one recording an award of a new form of silver medal to M. Dupoy for his arrangement by injector of water-level compensator meters. Theoretically, the report says, M. Dupoy's arrangement appears all that could be desired; and the apparatus has up to the present thoroughly justified the opinions formed concerning it. M. Dupoy is to be congratulated on a successful improvement in wet meters. The last report was one on heating apparatus; and M. Mecker obtained a medal for an intensive burner, and M. Sar one for an automatic lighting burner.

Technical Papers.

It was nearly 4 o'clock in the afternoon of the first day of the congress when a start was made with the technical contributions. In all, there were sixteen papers in the list, one having been withdrawn—namely, that by M. Chervet on "Methane." M. Lacaze (of the firm of the Cie. Continentale des Compteurs, of Paris, who are the makers of the De Brouwer machines and conveyors) was the first member called upon, to read his paper on "Mechanical Manipulation in Gas-Works." Time being an element of consequence, he was asked by the President to abbreviate his remarks as much as possible. There was all the more reason for this as the paper contained practically nothing new, but was little more than a catalogued list of installations done by his firm, starting from the French patent of M. de Brouwer of Dec. 7, 1895. The commercial aspect of the paper was emphasized by the free distribution of a well got up album of illustrations, which photographically, and by key plans, showed the various installations carried out by the firm referred to. There were exposed views of the first charging machine at Bruges, the coke conveyors at Fontainebleau (1897), the pusher at Barcelona (1903), the plant at Nice (1906) [which have all previously been illustrated in the "JOURNAL"], and several other examples of similar work. Also on the walls of the room were hung photographs of De Brouwer conveyors at Plymouth, Walsall, Wakefield, Liverpool, Salford, Newcastle, Fulham, Bath, and Nine Elms, London. More detailed reference was naturally made to the machinery at the Nancy Gas-Works, which were going to be visited later on in the day. There was no discussion whatever on the paper.

M. Coze next called on the authors of many succeeding papers, none of whom, however, was present or was ready to step on to the platform. Eventually, M. Marcou filled the breach with his paper on the "Utilization of Coke Dust as an Industrial Fuel by Means of Aero-Economizing Furnaces (on the Generet System)." This was a description of a special arrangement of blower and fire-bars adapted to burn coke dust under boilers. The special grille is alleged to last four or five years; and it is said there is a very small expenditure of steam for the blowing—4 or 5 per cent., as against a usual 8 to 20 per cent. However that may be, detailed figures of tests are given. But here, again, on the conclusion of the paper (or its summary) no one had any questions to ask or criticisms to make.

In the absence of M. Cabrier, his communication on the "Genevilliers" type of charging machine, was read by M. Bouvier. It is a machine on the lines of the "D.B." charger, but with slides instead of a belt. It is stated (but doubts were expressed) to be actually in operation at the Genevilliers Gas-Works on the outskirts of Paris. M. Verdier said that the machine was still in the test period; so nothing more need here be added.

Suction producers, and the advantages and disadvantages of chemical purification for poor gas, was a subject discussed by M. Camille Roche. Everyone, he said, was agreed that it was essential that gas should arrive at the engines deprived of all its dust and tar. The advantage of English anthracite was that it did not contain tar. The author referred to two explosions that had occurred with engines of considerable horse power, within his experience; and some mystery surrounded one of them at least. It would seem that the use of suction producers and engines for them have notable drawbacks. There was some discussion on the paper; M. Chevalet being followed by M. Naudet. In M. Godinet's opinion, suction gas was all very well for small plants; but its ability for larger and electrical installations was doubtful. The absence of dust was of the greatest importance. M. Coze said that poor gas required the most careful supervision; while M. Pierson (who is, of course, greatly interested in the subject) promised a paper on it next year. After M. Mallet (Past-President) had raised a question as to the sulphurous contents of poor gas, the discussion closed; and, it being 5 o'clock, M. Coze adjourned the meeting.

Visit to Gas-Works.

It had been arranged that at this hour trams should conduct members of the Société Technique to the gas-works; and they were duly visited, and proved very interesting. A somewhat striking episode occurred upon arriving near the site of the works. M. Mariez, the invalided Manager, was seen sitting at an open window in an adjoining house. The President and members foregathered under this; and M. Coze addressed a few words of sympathy, and of hope of speedy recovery, to the seen, but unheard, invalid. An inspection was then made of the coal-handling plant arranged to take coal out of the barges arriving on the Marne Canal, and to deposit it in the stores. This "Coal Unloading and Conveying Plant at the Nancy Gas-Works" was fully described and illustrated under that title in the "JOURNAL" of Nov. 18, 1902 (p. 1344), shortly after the work had been carried out. This description, together with that of the works generally,

which will be found in another portion of the present issue, will enable a sufficient idea of the situation and plant to be obtained. The works are old ones, dating back to 1835; but they contain many examples of modern apparatus. The coal plant itself is of rather elaborate proportion; and the same applies to the still more recently installed coke arrangement. The method and management and cleanliness everywhere apparent reflected great credit upon M. Mariez, the Manager, and upon M. Mains, the energetic and courteous Engineer, who, with his assistants, conducted various parties round the works. The charging and discharging of the retorts by means of the De Brouwer machines were closely watched with great interest; and satisfaction was expressed on all hands. At the close of the visit, M. Coze gave voice to the pleasure of the visitors; and his thanks to the Directors of the Nancy Gas Company were duly acknowledged. The members then separated; and the first day of the meeting was over.

More Technical Papers.

The programme appointed the rather early hour of a quarter to nine for the commencement of the second day's proceedings; but it was some minutes after the prescribed time when the reading of papers was continued. Authors' names were called, but there was no response, until M. Foiret briefly explained the paper that stood in his name on the Féry calorimeter, and continuous calorimetry. This is affected by a clever arrangement (which was exhibited) of a gas-meter, pressure-governor, and thermocouple connected to an electric meter. By these means, the calorific value of the gas can be ascertained; it being proportioned to the current set up by the effect of the difference of temperature on the thermocouple. In reply to the President, M. Foiret said the cost of the apparatus was between 250 and 300 frs. (£10 to £12). M. Emile Cornuault also spoke appreciatively of the apparatus. M. Chamon next described the "Rotary" meter; and he was listened to with considerable interest. Questions were put by M. Coze and M. Bouvier as to its adaptations, accuracy, and modifications for high pressures; and the author was thanked for the information given. Another kind of meter arrangement was described by M. Parsy; the object being to supply gas for a fixed sum—*e.g.*, 3 frs. for one burner for a month. M. Parsy is convinced that there are a lot of people who would become consumers of gas under such conditions; and it would enable similar arrangements to be made for paying for gas-burners as is now done for electric lamps. A throttle-valve is placed on the inlet to the meter. It is closed by the revolving of the drum, as effected in prepayment meters. It is opened by a contrary movement of clock gearing in such a way that, for a certain output of gas, the two movements of opening and shutting compensate one another. The President pointed out that the adoption of such meters would add to the capital involved in gas undertakings, with the risk that it could not be amortized by the small return to be reasonably anticipated. M. Cornuault and M. Lhomme also spoke; the latter to the effect that a far simpler method would be to arrange special terms for special clients.

The next to mount the platform was M. Heeley (of the Cie. pour la Fabrication des Compteurs, of Paris), who described an arrangement for automatically controlling governor pressure. The governor proposed, in addition to the usual parts, has a balanced cam on which runs a cable carrying weights acting at the end of varying lengths, according to the position of the regulating bell. The object is, of course, to keep the pressure constant at a given point in the distribution. This communication provoked no discussion. For a considerable length of time, M. Casaubon rapidly and fluently expounded his paper of about 50 pages, recording his investigations into the *rôle* played by diffusion in flames. Incidentally, also, certain aspects of the question of flame temperature are touched upon. It is undoubtedly an important and studious paper; and the author well-merited the applause he received. If anything, it is too essentially theoretical. But theory precedes practice, and a paper may be all the more valuable on account of its theoretical qualities. M. Mallet made the excellent suggestion that any possible discussion of a paper involving so much theory had better be postponed till next year, when investigators into the same subject could give their views and criticisms. This being the general feeling, M. Verdier was called upon to explain his "Note on a New Pyrometer with Direct Reading." He first pointed out the drawbacks to existing pyrometers—Seger, Nouel, Le Chatelier, Wanner, and Féry. This was a new modification proposed by the last-named. It consists essentially of a sheet composed of three metals—silver, gold, and platinum—placed one upon the other, connected with a spiral in contact with the heat rays. To this spiral is fixed a needle working on an indicator showing the temperatures. It is a very simple instrument, and can be safely entrusted to the hands of any ordinary workman. The price of the apparatus was stated to be 200 frs.

M. Dorigny then described an inverted burner, the "S. N."—signifying the Société Nationale d'Incandescence—the lighting power of which was given as 100 candles for a consumption of 100 litres per hour. An arrangement of the same burner exists for outdoor lighting. The three papers by M. Sar were the next to be considered. The first one contained a proposal that the Société Technique should formulate some regulation to be adopted to limit the tremors caused by trams. He had had difficulty in this direction with his mains at Montpellier; and an explosion had occurred, due to damage caused to them by the trams. The President said the matter would be considered by the Société Technique in conjunction with the Chambre Syndicale du Gaz. M. Pierson referred to the late accident in the East-end of London, due to a breakage of a main by a steam-roller. M. Parsy pointed out that on railways indicator diagrams were taken to record the vibrations experienced in running; and nothing would be easier than to do the same thing on the trams, when thought advisable. M. Sar's second paper concerned the filling and emptying of tar and liquor tank-waggons by means of compressed air. Some sketches of the arrangements adopted at Montpellier for this purpose were shown. The third paper by M. Sar had been prepared at the request of the President, and was directed to the means to be used for developing the sales of coke—a subject, it will be remembered, which formed the bulk of the Presidential Address. M. Sar's principal proposals for the extension of coke sales were its use in poor-gas producers for motive power and for heating bakers' ovens. In the brief discussion that followed, M. Pierson enlarged on the use of coke in producers and for the manufacture of water gas; and M. Bachelay said that at Toulon he had cultivated its use for military purposes—notwithstanding an official War Office note (reproduced in M. Sar's paper) declaring (Art. 56) that "Coke is a *combustible de luxe* which does not give any flame, and, therefore, requires more time than coal to effect boiling."

This practically ended the consideration of papers; for M. Ch. Chapat was not present to add anything to his "School of Gas," a paper which gives the syllabus of the gas training initiated at Bremen by the Société Continentale Allemande du Gaz, of Dessau. His second paper takes the form of a "Dictionary of the Gas Industry," a publication of 120 pages, giving lucid explanations of French terms employed in gas-works. In his preface to gas engineers, he says: "There does not exist any gas dictionary, although the electrical industry, though younger, already has several. I have tried to fill up this gap. The work presented has no pretentions to be scientific. I have simply endeavoured to explain, as clearly as possible, the terms used in the gas industry, and to describe briefly the apparatus, bodies, and materials which are applied in some way or other in the industry, or which are derived from it." It is a somewhat ambitious undertaking, and rather out of the ordinary rut; and though there are no doubt to be found omissions and mistakes, it may be that such a work will prove of some utility. This finished the papers and the morning's work; and the meeting adjourned.

Séance de Discussions.

Before entering upon the new feature of this year's congress of the Société Technique—namely, the "Séance de Discussions" or "Open Conference," as it might be called—an exhibition was given of an apparatus for cutting iron plates by means of oxygen and coal gas. A jet of oxygen, directed on to a piece of iron or steel previously made white hot in one point, burns it with great intensity, and the metal is cut amid a shower of sparks. The blow-pipe adopted has been arranged also for the purpose of using coal gas with the oxygen, by which the certainty and power of the cutting are increased. In the foyer of the Salle Déglin, pieces of metal 150 mm. (about 6 in.) thick were cut in two by this apparatus. The temperature reached was said to be 2300° C. The apparatus had been used to repair blown and faulty holes in ironwork, and for many other purposes. M. Leclaire said he had five men who worked the apparatus. He had made holes in gasholder sheets with it, without the flame even touching them. The apparatus is certainly one that may be useful for special operations; and it affords another instance of the great variety of uses to which coal gas can be put.

The first subject of debate was the standardizing of screw-threads for gas-fittings. The acknowledged desirability of such standards was expressed by the President in his opening remarks; and he said something of the kind had been done in the metallurgical industry. M. Payet referred to his paper on the subject a year or two ago, and pointed out that the P.L.M. Railway and other establishments had standardized their work. The following resolution was read by the President, and unanimously adopted by the meeting, in view of the forthcoming second conference of the International Photometry Committee: "The Société Technique de l'Industrie du Gaz en France, assembled in their 34th Congress, express a wish that the Technical Societies of the different countries will combine for the purpose of re-examining and effecting, in common agreement, the standardizing of screw-threads of apparatus used in the utilization of gas." This resolution, it will be remarked, only gives expression to a pious hope to which all may subscribe; but it hardly seems to advance the question a step farther than it was seven years ago, when the matter cropped up at the International Gas Congress of 1900 in Paris. However, this was all that was now done, except that M. Bachelay wanted bricks also to be standardized. But that is another question, though no doubt worthy of consideration.

So we passed on to the second item for discussion—"Vertical Retorts, and their Practical Results." It must be confessed that nothing new was brought out in the discussion, which was merely a hash-up of what various members had seen and been told when visiting installations—almost entirely those in Germany. Though these accounts of visits may be useful in the way of adding to the general information, such hearsay evidence—as it were—can hardly be considered satisfactory, when it forms the whole pabulum of the discussion. M. Heeley had visited Cologne, Dessau, and Berlin. M. Arth, the Professor of Chemistry at Nancy University, had been struck by the simplicity of working of vertical

retorts. Dr. Bueb said, so it was understood, that 28 men had been reduced to 2. The President explained, by a blackboard sketch, the construction of some settings; and M. Cornuault pointed out that if one had a short vertical retort, as seemed to be favoured, say, 4 metres long, only 3 metres of it would be utilized, so that nothing would be gained compared with long horizontal retorts and heavy charges. Inclined retorts had made great progress during the last few years; and verticals could and would do the same. M. Coze then gave some figures of the Dessau results, and accounted for considerable variations in the make of gas per ton by the different strata of the coal employed. Dessau had the great advantage of having experimental gas-works. M. Cros (of Amiens) referred to the vertical installations working in England, and spoke as to the much greater length there of the retorts. Mr. R. S. Gardiner mentioned what was being done at Bournemouth, but said that that installation was on a smaller scale than those in Germany. M. Foiret (of Lyons), in a dry, humorous vein, described some apparently abortive experiments; and M. Marquisan referred to the Teulon-Verdier vertical retort [the patent for which has been described in the "JOURNAL"]. Lastly, M. Mallet recalled to mind the fact that M. Crapoune had tried vertical retorts at Lyons some years ago. The discussion, though not very fruitful, had taken up a good deal of time; and so the President said he would limit subsequent speakers to 6 minutes each—a very wise and proper regulation, and one that might be more generally adopted.

The next subject was the "Duration of Carbonization, and the Importance of the Weights of the Charges." M. Laurain said that the Compagnie Parisienne du Gaz had carbonized exceptionally heavy charges in 4 hours; and he asked for information from engineers who had adopted a similar course. M. Teulon (of Marseilles) mentioned his method of paying his stokers so as to get good results from maximum charges. M. Godinet commented upon the revolution in charging caused by the new forms of stoking machines. The thin, light charges at La Villette Gas-Works, he said, had been broken up by the pusher; but M. De Brouwer traversed this, by instancing a gas-works in England where light charges had been satisfactorily discharged by a pushing machine. The President, in closing the discussion, said there seemed to be a difficulty in arriving at a definite conclusion; and he hoped that some of them would experiment on light and heavy charges in their works, and formulate their results.

The lighting-up and extinguishing of burners at a distance was the next topic. M. Bijeard read an account of his experiences at Angers. Mr. R. S. Gardiner gave figures showing how extended was the adoption of the Gunning apparatus. At Bournemouth, there were a great number of such appliances; and 12 men did all the work of cleaning and repairing. There were 300 similar appliances at Oxford. At Copenhagen, the adoption of a system of automatic lighting had reduced the number of men by one-half. Dr. Rostin's system in use at Tottenham was mentioned, and also that of the "Bamag" Company. Figures of comparative cost were also given. M. Payet said the delicate part of such apparatus was the actual lighting. A show of a few automatic lighters was given in the foyer of the hall.

"Naphthalene" is a big subject, but it was touched upon—to say it was anything more than touched upon would hardly be correct. For time was getting on; and members were beginning to think there could be too much of technical papers and discussions. All that was referred to was the absorption of naphthalene by treatment in washer-scrubbers. M. Heeley described Dr. Bueb's process, and said that the oil used had absorbed 25 per cent. of its weight of naphthalene; but this figure had not been reached in the experience of other speakers. M. Godinet blamed high heats for all the trouble—or, at least, the heats not being proportioned to the charge. M. Arth (of Nancy University) also spoke.

The last subject taken was the manufacture of cookers and their design so as to give the best results for the gas consumed. The opening speaker seemed inclined to drift into a commercial disquisition, but was stopped by the President, who pointed out, in forceful language, that the French Gas Society was a Technical Society, and that they recompensed makers of apparatus which showed technical improvements. To effect economies in consumption was in the best interests both of gas suppliers and consumers. These remarks were warmly applauded. After a few observations by M. Casaubon, the President complimented M. Sar on what he had done in the way of popularizing gas consumption. Without any further formality, this concluded the discussions; and the technical business of the Congress was over.

It will be gathered from what has been said that the technical programme, and especially the debating meeting part of it, was, as is not uncommon, overloaded. It would perhaps have been better to have discussed fewer subjects, and allotted more time to them. But be that as it may (and it must be supposed that the Committee of the Société Technique are the best judges), the first debating conference must certainly be pronounced a success. It gave an added interest to the proceedings; and the practice thus begun will no doubt be a feature of future programmes.

Lecture and Further Visits.

On Thursday morning, at 9 o'clock, the members assembled in the Institut Chimique to hear a lecture by M. Muller, the Professor of Electro-Chemistry. M. Arth, the Director of the Chemical Institute, expressed his thanks at having been invited to take part in the previous day's proceedings. He mentioned that among the munificent donors supporting the work of the Faculty of Science, the Gas Company of Nancy held an honoured place. [The subscription given amounted to 10,000 frs., or £400.] After M. Vogt, another Director of the Institute, had spoken, M. Muller, who, it is believed, is the first professor of electro-chemistry to be attached to any University, launched into the matters of which he is such a master. By experiments successfully carried out, and by blackboard sketches, he expounded a great deal that was new to most of his hearers. He unfolded the mysteries of ions of electricity as applied to chemistry, and brought home the vast proportions and limitless possibilities of the science. He treated of the reversability of chemical actions, of the effects of electrolytic phenomena, of the increase of conductibility as ions become more active, and so on. The members were greatly interested, and applauded the lecturer as he passed from one topic to another. At the close of the discourse, M. Coze well expressed the feelings of those present, who signified their approbation in the usual way. Members were then conducted through the buildings, and shown several other experiments of interest—liquid air and its adaptations among them.

In the afternoon, a large party left the Place Stanislas in carriages provided by the Nancy Gas Company, and visited the large metallurgical establishments of the Compagnie des Forges de Chatillon, Commentry & Neuves-Maisons. The long drive amid the charming country was greatly enjoyed; and the famous works afforded a vast amount of interest.

On Thursday evening only a small number visited the Central Electric Lighting Station, which is planned on a fairly large scale, with further extensions in prospect. It is noticeable that a large proportion of the street lighting of Nancy is done by electricity—an arc light being put in many thoroughfares on every tramway post, although these are, of course, opposite to one another, and not far apart. What splendid public illumination could be effected for the same expenditure, if high-pressure gas lighting were adopted.

Some changes were made in the arrangements for Friday morning; three establishments being visited in rotation. The first was the power station of the Compagnie Générale Française de Tramways. The next, a factory, belonging to MM. C. G. de Langenhagen, for the manufacture of straw hats; and the last, an interesting inspection of a printing works, principally engaged in the printing of picture post-cards. In each of these cases, the President of the Société Technique well expressed the thanks of the visitors for the favours accorded. Though it was noon when the morning's visits were over, at one o'clock in the afternoon members were at the railway station for the visit to Lunéville (20 miles distant), where the works of MM. Diétrich et Cie., motor-car and railway-waggon builders, proved of interest.

Two days were thus fully occupied with instructive and interesting visits to industrial establishments. Perhaps, however, had the Congress been shortened by one day in this respect, it would have been better.

Dinners, Concert, and Excursion.

On Tuesday evening, the Compagnie du Gaz de Nancy entertained the Société Technique at dinner, which was given in the Grand Salon of the Hôtel de Ville—a magnificent room embellished with panel paintings by E. Friant and a ceiling painted by A. Morot. The officials of the Préfecture and the town were present, and the usual toasts were honoured by the 250 guests.

The following evening, the annual banquet of the Society was held in the Restaurant Walter. The President expressed the thanks of the Society to all those who had assisted at the Congress—to M. Dupré for distributing the medals, to the Mayor, to M. Guy Ropartz for arranging the concert, to MM. Arth, Vogt, and Muller, of the Chemical Institute, and to the Directors of the industrial establishments for permitting the visits. After other speeches, M. Emile Cornuault (who, it may be remembered, is also this year President of the Société des Ingénieurs Civils de France) humorously replied to the toast of the Past-Presidents.

On Friday evening, the Grand Salon of the Hôtel De Ville was again the scene of a large gathering; this time including ladies, who assembled to hear a concert given by the Conservatoire of Music at Nancy. The town during the present week is also the centre of a great international musical competition, 100,000 visitors (so it was said) being expected.

The Congress officially closed after the concert; but on Saturday nearly all those who had attended the meetings joined in the special excursion arranged to Gérardmer and the Vosges Mountains. This, with favourable weather, proved most enjoyable, though the day's journeyings lasted from eight in the morning till midnight. The prettily situated little town, 2200 feet high, was reached just before eleven o'clock. After lunch, electric trams took the party to the Schlucht—a mountain pass forming the present boundary between France and Germany. From there, Hohneck, the second highest point of the Vosges Mountains, was reached; its height being about 4500 feet. Beautiful views of mountain and lake, and valley and plain, were obtained. Then, back to Gérardmer, dinner, train, and Nancy at midnight—and a further journey still for some of us. So finished a delightful day, and a pleasant Congress.

We learn that Mr. J. Hammond, the Engineer and Manager of the Eastbourne Gas Company, has purchased from the Trustees the residence of the late Mr. William Young at Peebles.

THE NANCY GAS-WORKS:

THEIR DEVELOPMENT AND PROGRESS.

In connection with the annual meeting of the Société Technique du Gas en France held at Nancy last week, an account of which appears elsewhere, a few particulars of the historical development and the present state of the gas undertaking there may be of interest.

The works were founded in 1835, at which time the gas industry was still in its infancy, though rapidly extending and making firmer its foundations. It had to struggle against difficulties and prejudicies of all kinds, as any innovation must. At Nancy, as we learn from a pamphlet giving an account of the works, there was at first no protection afforded to the management. Private interests were antagonistic, such as those of the merchants, who saw in the spread of gas a decrease in their sales of goods previously supplied for artificial illumination. The gas workers themselves, of course, lacked experience; and no one knew what to do with the bye-products—coke, tar, liquor, and lime. There was further the competition of portable gas.

In those early days, the Nancy Gas-Works boasted of three beds of one retort each, two purifiers, and two gasholders—the capacity of the two being 150 cubic metres, or 5300 cubic feet. The length of the mains was 2150 metres, or about 2300 yards. Gas was sold at 5 c. per hour of consumption per burner. Slowly progress was made. The use of ammoniacal liquor for agricultural purposes was found out; pitch and other products resulting from tar distillation were profited by; and coke as a fuel began to extend. In 1847, the Gas Company made a contract with the town authorities; and a new gasholder of 1000 cubic metres (35,300 cubic feet) capacity, a retort-house, and a purifier-house were erected. In 1851 and 1857, other holders were put up; and in 1863, an exhauster on the Schmitz system was used. The price of gas at this time was, it is believed, 50 c. per cubic metre (11s. 4d. per 1000 cubic feet); but in 1866 it was reduced to 35 c. (7s. 10½d.). As usual, such a reduction greatly increased the demand for gas, and a new holder of 4000 cubic metres (141,300 cubic feet) capacity was required. In 1872, yet another holder, of 6000 cubic metres (212,000 cubic feet), was wanted; and other extensions were made. Similar extensions were carried out during the following twenty years; and in 1894, a new agreement with the town was entered into, the price of gas being reduced to 2 c. per cubic metre (4s. per 1000 cubic feet). History again repeated itself, and a great increase of consumption followed, which necessitated a complete reconstruction of the works. In 1901, plant for receiving coal from barges on the adjacent canal of the Marne to the Rhine, was put up. It was described in the "JOURNAL"* soon afterwards. In 1904, a new telescopic gasholder, of 20,000 cubic metres (706,000 cubic feet) capacity, was constructed. Coal and coke plant and retort-house machinery were installed in 1906; and future extensions comprise new purifying plant and a new retort-bench, which is, indeed, in course of construction. Before describing the works as they now stand, the following figures will show at a glance the progress made:—

—	1835-47.	1847-63.	1863-72.	1872-78.	1878-82.	1887.	1907.
A. . . .	31,443	38,795	49,305	52,978	66,338	81,593	102,000
B. . . .	2,150	6,245	10,850	35,200	40,545	77,719	170,000
C. . . .	207	903	2,418	4,536	6,007	8,830	29,000
D. . . .	750	1,800	7,600	12,800	12,800	22,500	40,000

[A. Population. B. Length of mains in metres. C. Cubic metres of gas sold per 24 hours. D. Gasholder capacity in cubic metres.]

DESCRIPTION OF THE PRESENT WORKS.

The coal, as already mentioned, arrives by canal; and reference has been made to an article describing the plant at the time of its being first put into work. Nothing further, therefore, need be said here. There are two retort-houses, containing three benches, each being composed of six through beds of retorts. They are provided with charging and discharging machines and hot-coke conveyors, all of the De Brouwer type. The coal-projecting machine in each case is arranged on the opposite side of the bench to the discharging pushing machine. The charging-machines have on them coal-hoppers, which are filled as required from two overhead tanks, each of 60 cubic metres (2129 cubic feet). The fixed coal-tanks are supplied in the usual way from an elevator, to the boot of which tip-waggons carry the coal. The two hot-coke conveyors run parallel to one another, and are 10·300 metres from centre to centre. Upon leaving the retort-house, they rise at an angle of 21 degrees, leading the quenched coke to two tanks, where it is passed through rotary screens. Arrangements are provided for the direct supply of carts with coke in bulk, and also for the measured supply in sacks. The electrical energy for supplying the De Brouwer machines and other plant is derived from three dynamos driven by gas-engines. One of these is a "Duplex" engine of 75 H.P.; another is a "Charon" engine of 30 H.P.; and there are two Crossley engines of 22 H.P. and 10 H.P. respectively.

As to the other apparatus in the works, there are four sets of pipe condensers, placed in the open. The exhauster-room is a well-proportioned and arranged one, containing one Schmitz exhauster, already referred to, and two of the Beale type. After the exhausters are placed three Pelouze and Audouin condensers (or tar-extractors, as they are more generally called in England), two being for 15,000 cubic metres of gas each, and the other one designed to pass 30,000 cubic metres. There are also three "Standard" washers of similar sizes. The purifier-boxes, with rounded corners, are twelve in number, and measure 3·56 metres by 5·50 metres. There are three station meters of the same capacities as the Pelouze condensers and washers. In fact, generally speaking, the plant is arranged in two units, each of 15,000 cubic metres of gas per diem, and a third unit of 30,000 cubic metres. Four holders allow of a total storage of 40,000 cubic metres of gas, which is regulated by five governors, one having automatic means of loading to compensate for varying demands. The total length of mains now reaches 170 kilometres, or about 105 miles, conveying gas to 3000 public burners and to 27,300 customers, having 187,000 burners.

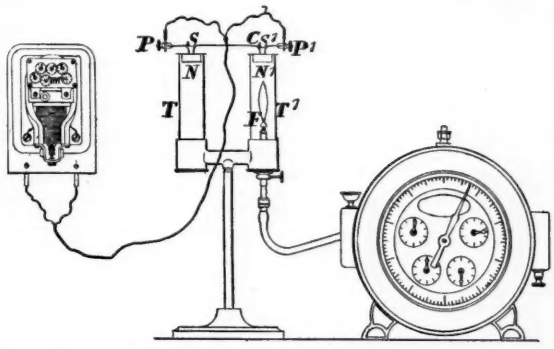
The works, of course, bear the indications of smaller beginnings and of the various periods of extensions. But, with the modern plant now installed or being put up, the site will be well and conveniently used. Everything bears witness to the able control of the Manager, M. Charles Mariez, and to the careful arrangement and working of the Engineer, M. Mains, to whom our thanks are due for the information we have been able to furnish.

* See "JOURNAL," Vol. LXXX., p. 1344.

THE FÉRY CONTINUOUS CALORIMETER.

At the Congress last week of the Société Technique, a short paper describing the Féry continuous calorimeter was submitted by M. Foiret.

The calorimeter, as will be seen from the accompanying illustration, consists of three essential parts—a gas-meter, a pressure regulator, and a thermo-electric couple, connected with an electricity meter. The couple is formed of a number of pairs of soldered nickelled constantan (an alloy of equal parts of nickel and copper) placed at the ends of two communicating tubes TT¹, and open at the top. The constantan, in the form of the plate C, is soldered at its two ends on two nickel plates NN¹, similar to those of the Mecker burner. The squares are tongued exactly in the upper part of two communicating tubes.



The flame of the gas of which the calorific power is required to be measured is consumed in a burner F, placed in the lower part of one of the two tubes. The burner is replaced by a lamp fitted with a wick when the calorific power of a liquid is being measured. The whole of the air needed for the combustion of the gas is led in by the tube T, in which it circulates from top to bottom, after having cooled the junction S which remains constantly at the surrounding temperature. The products of combustion traverse the plate N¹, and heat the junction-piece S¹ in doing so, In quadrillages PP¹ are the two poles of the couple. The difference of temperature between the two junctions gives rise to a difference of potential and the electric current generated is measured in an O'Keenan meter. It will be remembered that the difference in potential of a thermo-electric couple is proportional to the difference in temperature of the two junctions, but is not affected by the variations in the surrounding temperature. The difference in potential produced at the edges of the couple is proportional to the calorific power of the gas or of the liquid under examination. This fact has been confirmed by numerous tests with ordinary gas, methylated alcohol, ether, and acetate of amyl; and as a result of it there has been standardized an electricity meter directly in calories.

In using the calorimeter for ascertaining the calorific power of gas, the readings may be taken intermittently, or continuous measurement may be effected. To take a reading, all that is necessary is to pass a certain volume of gas through the meter, and read on the electric meter the corresponding number of divisions. The ratio of the number of calories to the quantity of gas consumed (in litres) gives the calorific power of the gas at the temperatnre of the experiment. The apparatus permits of the total volume of gas passed through the meter in 24 hours being totalled, and the mean calorific power of the gas throughout the working day thus obtained. The consumption of coal gas in the burner is about 15 litres (0·5 cubic foot) per hour.

Another form may be given to the apparatus, based on the above system, when a rapid estimation of the calorific power is wanted. The gas-meter is removed, and a galvanometer substituted for the electricity meter. The needle of the galvanometer then shows at a glance the calorific power at a given moment. The readings are accurate only when the supply of gas is constant and of the same specific gravity. These conditions are usually fulfilled in the case of coal gas and other gases, and the galvanometer is graduated in calories for one or other of these. In this form, the apparatus is a continuous indicator of calorific power, and it may be applied in gas-works, for rapidly checking the make, as well as for producer gas. For the latter, it is only necessary to draw off the gas from the furnace with a meter-aspirator, and pass it to the calorimeter at a uniform rate of 40 litres (1·4 cubic feet) per hour.

The calorimeter may be easily made to register. In this case, the register curve of the calorific power is traced by points—the cylinder which turns the register rising once every minute, and pressing against the inked pen of the indicating needle which makes the record.

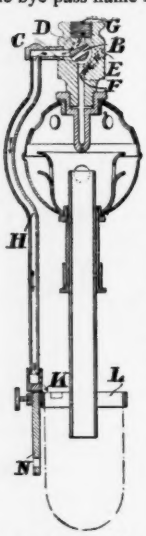
REGISTER OF PATENTS.

Bye-Pass for Inverted Gas-Burners.

SAUL, J. H., of Hampstead, N.W.

No. 15,027; July 2, 1906.

This is an arrangement of incandescent gas-lamp wherein, by means of a triple-ported supply valve, the gas is delivered to the burner before the bye-pass flame is cut off, while the burner supply is not cut off till the bye-pass flame is ignited.



Saul's Inverted Burner Bye-Pass.

The plug has a central main gas-supply port B, a groove C, extending about half-way round the plug, and a bye-pass D; and it is actuated by a disc or lever at one end in the usual way, and limited in its movement. The limiting means are preferably an adjustable screw E, carried by the plug spindle and a pin or other stop F on the plug casing. When the plug is in the cut-off position (shown), a small supply of gas from the inlet G passes through D, and along the pipe H, and burns with a small pilot flame at the jet orifice K, which is so inclined as to direct the flame right into the mantle. It also impinges upon the mouth of the burner-tube, so that the gas will be ignited the instant it reaches the end of the burner-tube and before an explosive mixture accumulates. When the plug is turned in an "anti-clockwise" direction, the gas supply to the pilot flame is first increased and maintained until the port B is open—thus ensuring proper ignition at the burner. But before the port fully registers with the inlet G, gas will pass to the burner by the groove C, in order that there may be an early supply of gas to the burner to ensure ignition before the bye-pass supply is cut off. When the reverse movement is taking place, there will be a late supply of gas to the burner to ensure the ignition of the bye-pass flame. The continued movement of the plug to the "fully open" position causes the pilot flame to diminish till it is extinguished.

When shutting off the supply to the burner by turning the plug in a "clockwise" direction, gas will be admitted to the bye-pass before the supply to the burner is cut off, in order that a pilot flame may be ignited; and after the burner flame is extinguished, the small further movement of the plug, till stopped by the pin F, will reduce the pilot flame to the desired size.

The lower end N of the bye-pass pipe H is adapted to form a supporting guide for the mantle-ring L; the latter being adjustably secured upon the bye-pass pipe H by a set-screw. This permits of the distance between the bottom of the mantle and the end of the burner-tube being varied—"a matter of importance where gas is supplied in different districts at various pressures."

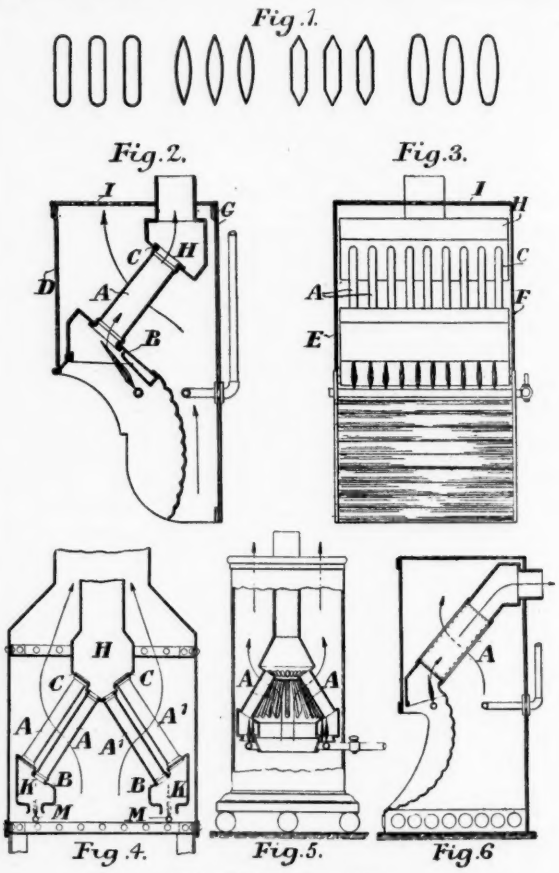
Gas Heating Stoves.

JUNKERS, H., Professor, Aachen, Germany.

No. 27,380; Dec. 1, 1906.

This invention relates to gas heating stoves where the air heated is kept separate from the flame and hot products of combustion. It has for its object "to construct a compact apparatus which will transmit heat to a large quantity of air with economy in gas consumption and in an effective manner on hygienic principles, so that the air is uniformly heated and leaves the stove at a comparatively low temperature."

In stoves as heretofore constructed, says the patentee, it has been proposed to heat the room by warming the air which passes through the stove; but in such constructions, although flattened tubes arranged side by side have been used, the relative proportions of the passages for the products of combustion and for the air to be heated have been such that "economical results have not been obtained and uniform heating of the air was not effected." According to this invention, a stove is constructed with the passages for the air and for the products of combustion so proportioned that, on the one hand, the total cross sectional area of the air-passages is many times greater than the total cross sectional area of the gas-passages, while, on the other hand, the length of the air-passages is shorter than the length of the passages for the products of combustion. The heating body comprises flattened tubes each having, for example, an elliptical or len-shaped cross section. The tubes are arranged side by side after the manner of a grating, with their flattened or larger sides adjacent and a suitable small interval between them. The heating gases are brought into contact with the inner side of the wall of each tube; the air to be heated passing over the other side of the wall—the outside of the tube. The ends of the tubes are fixed in place so as to prevent the heating gases from mingling with the air which is heated.



Junkers' Gas Heating Stove.

Fig. 1 shows different cross sections of flattened heating tubes which may be used. Fig. 2 is a vertical section of a stove suitable for attachment to a wall. Fig. 3 is a front elevation of the interior of such a stove (the outer casing being shown in section). Fig. 4 is a vertical section through a stove suitable for large rooms. Fig. 5 shows a circular stove (partly in vertical section). Fig. 6 is a vertical section through a stove constructed so that the air passes through tubes with the outer surfaces of which heating gases come in contact.

All the tubes illustrated in fig. 1 have cross sections of a flattened shape, and are rounded or pointed at their edges or narrowed sides, so that the air passing over them may meet with as little resistance as possible. If it is desired that the heating gases circulate in the tubes while the air passes between them (as in the arrangement illustrated in figs. 2 and 3) the heating tubes A are connected at their ends by gas-tight joints to plates B C—the latter forming a portion of the wall of the main flue H up which pass the products of combustion. The lateral walls D E F G of the stove are not perforated, but form a draught-producing casing. The cover I of the stove is, however, provided with numerous openings for the escape of the heated air. Where the stove is suspended from, or attached directly to, a wall, the back plate G of the casing may be dispensed with.

The stove illustrated in fig. 4 is intended for heating large spaces (for example, a church), and is conveniently rectangular in plan and provided with two or more gas-burners M, the flames from which are situated within combustion chambers K. Owing to the large quantity of heat to be transmitted in this construction, the heating pipes would have to be made of too great a width for convenience if arranged in a single row, and difficulty would be experienced in obtaining gas-tight joints with the end plates B C. Two series of tubes, A A^1, are therefore employed; each tube being approximately half the width that would be necessary if a single row were employed.

In the circular stove shown in fig. 5, the heating tubes are so disposed as to form a truncated cone or pyramid the base of which faces the air inlet. With this arrangement the intervals between the tubes A are larger towards the lower and hotter ends of the tubes than at the top. Consequently, a larger quantity of air will come in contact with the lower portions of the tubes, which will therefore be cooled to a greater extent. In this construction also two or more series of tubes may be arranged radially. The inclination of the tubes may vary between the vertical and horizontal. Where the tubes are disposed radially and horizontally, the heating body would be of disc-like form.

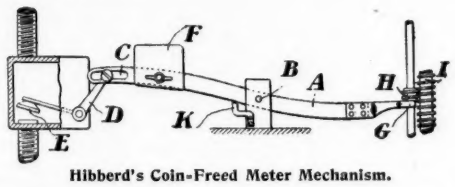
Fig. 6 shows a construction of stove in which the air circulates through the tubes A, with the outer surface of which the heating gases come in contact. In this case the tubes are short, but in cross section appear of considerable width.

Coin-Freed Meters.

HIBBERD, C. E., of Auckland, New Zealand.

No. 2158; Jan. 28, 1907.

This invention relates to mechanism for operating the valve which controls the supply; and is an improvement on patent No. 17,877 of 1905. According to the present invention, the mechanism by which the valve is moved is directly controlled by one end of a substantially straight single lever, the other end of which is directly controlled by the meter driven means.



Hibberd's Coin-Freed Meter Mechanism.

The lever A is pivoted at B to any convenient part of the meter frame, and is provided at one end with a slot C, engaged by a suitable pin on the end of a lever D, which is directly connected to the valve E. A weight F (made adjustable if desired) is mounted upon the end of the lever A nearest the valve, and thus tends to depress the lever D, and so open the valve E, through which the gas has to pass. The opposite end of the lever A is provided with a fork G, adapted to be engaged by a worm H, which gears with a screwed column I.

The operation of the worm and column was described in the earlier patent; and in the present apparatus the worm, in descending, engages the fork G; and thus positively depresses that end of the lever and slowly closes the valve E. Upon the ascent of the worm when actuating the coin-freed device, the weight F opens the valve—a stop K being provided to stop further movement of the lever when the valve is fully opened.

Incandescent Gas-Burner.

TANCZER, E., of Budapesth, Hungary.

No. 2490; Jan. 31, 1907.

By the present invention, the gas and air mixture is conveyed to the incandescent body with a spiral motion, "in such a way as to give the mixture a whirling effect, owing to the centrifugal forces set up, so that a flame is obtained which adapts itself to the tapering or conical form of mantle."

Tanczer's Incandescent Burner.

The nozzle preferably extends beyond the air-inlet apertures of the mixing-tube. The form of nozzle is preferably such that the air drawn in flows into the mixing-tube as steadily as possible—the mixing-tube being tapered "in known manner" in the middle. The burner-head is shaped like a dish, while the cover plate closing it is provided near its periphery with rows of holes arranged in a circle. There is a cone on the cover plate, the point of which extends to the mixing-tube; while the circular base of the cone extends to the ring of holes in the cover plate, so that the distance between the base and the upper edge of the burner-head approximately corresponds to the perforation of the cover plate. Three spirals or propeller blades are arranged on the cone (extending up to the cover plate), the curves of which all run in the same direction, while their outer edges extend to near the inner wall of the burner-head, so that the mixture of gas and air entering between the blades is for the most part forced to rise in spiral lines between them. As the blades conduct the gaseous mixture to the cover plate, the mixture leaves the apertures of the latter "with the same unchanged spiral motion with which it reached the cover plate." Thus "a narrower conical flame is obtained, as compared with the arrangements at present known, which flame encloses a comparatively high hollow space." The flame accordingly adapts itself to the mantle, and causes it "to become strongly incandescent over its entire extent."

Prepayment Gas-Meters.

COX, W., of Lavender Hill, Wandsworth, STAPLES, W., of Clapham, and GEORGE GLOVER AND CO., LIMITED, of Chelsea.

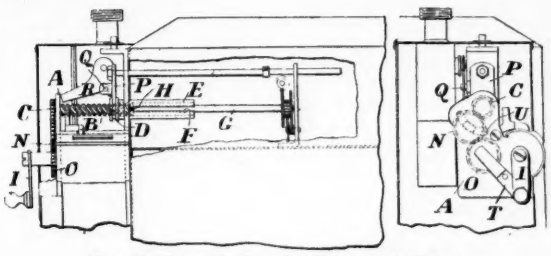
No. 5108; March 2, 1907.

This invention relates to improvements in patent No. 19,494 of 1902, and in the coin-mechanism described in patent No. 20,710 of 1899. The present invention "provides for the more accurate delivery of small quantities of fluid, for the more ready fixing of the operative parts of the mechanism in a meter, and other improvements in detail." The improvements are also applicable to meters set by an inspector directly without the intervention of a coin.

A is a frame plate rotatably supporting a screw B, to which the gear-wheel C is keyed. The screw engages a nut D having a sleeve or tubular extension E in which a slot F is formed. A coupling shaft G carries a projection H engaging the slot. By operating the handle of the coin-pocket, after inserting a coin in the pocket, the gear-wheel C and the screw B are rotated in one direction only—the connecting mechanism being arranged as in the entire patent; and this rotation moves the nut D towards the left. The movement of the nut acts through a fork P carrying a pin Q to raise the valve lever R and open the gas-inlet valve.

When the meter mechanism is at work, it acts through a worm to drive the coupling shaft G, and through the projection H and slot F rotates the nut D, thereby moving the latter towards its initial position and closing the valve when the quantity of gas paid for has passed through the meter.

In the construction described in the prior patent the wheel (the position of which must be adjusted according to its size) to be changed in accordance with variations in the price of gas is mounted on a quadrant arm. In the present construction, the wheel N is mounted on a trunnion which is adjustable in a curved slot U formed in the frame plate, "thereby simplifying the construction of this part of the mechanism without diminishing the ease with which a change in the velocity ratio of the train can be made." The removable wheel O is held on its spindle by a movable arm T.



Cox, Staples, and Glover's Prepayment Meters.

The gearing connecting the shaft G with the meter mechanism comprises, in a meter worked by a silver coin, a wheel engaging with the worm of the meter spindle and loose on the coupling shaft G, but fast to a pinion. The pinion gears with a wheel which is loose on a trunnion, but fast to another pinion which gears with a wheel keyed to the shaft G. These wheels are all mounted on a single standard, and can thus be readily fixed in a meter. In the "penny" meter, the intermediate wheels are dispensed with, and the worm gears directly with the wheel fixed on the shaft G.

In meters that are to be operated by an inspector without the intervention of a coin, the screw B is actuated directly by the inspector through a lever or key under his control.

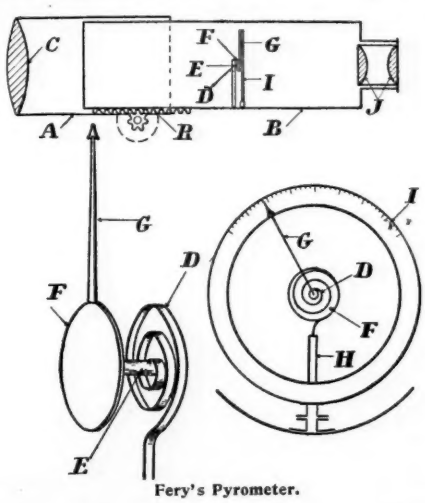
Pyrometers.

FERY, C., of Paris.

No. 6890; March 22, 1907. Date claimed under International Convention, April 3, 1906.

This invention relates to temperature measuring devices which utilize the radiant energy emitted by a hot body as a basis for the measurement of the temperature of the body. Patent No. 18,382 of 1904 has already been granted to M. Fery for a radiation pyrometer wherein radiation proceeding from a hot body is focussed upon a junction of two dissimilar metals; the heating of the junction thus produced giving rise to an electromotive force, which causes deflection of a galvanometer connected to the junction. The object of the present invention is to enable temperature readings to be obtained directly from the pyrometer itself without the use of a galvanometer or other auxiliary apparatus. The radiation emitted by the hot body, instead of being focussed upon a thermo-electric junction, is focussed upon devices of which some part is capable of expanding when heated; and suitable means are provided for "rendering the expansion apparent upon a magnified scale, so that by inspection of the position taken up by the magnifying devices the information necessary for an estimation of temperature can be obtained." The parts which expand when heated by the radiation from the hot body are, for example, two thin strips of dissimilar metals soldered together and formed into a flat spiral, which either becomes partly untwisted or twists up further when its temperature is raised.

The illustration shows a longitudinal and cross section of the apparatus; also a perspective view of the sensitive or receptive member.



Fery's Pyrometer.

A B are two cylindrical tubes forming the body of a telescope and capable of sliding one within the other to adjust the focus by means of a rack and pinion motion R. The front tube A carries a lens C, at the conjugate focus of which there is formed a real image of the body whose temperature is to be measured. At the conjugate focus there is a bimetallic spiral strip D, consisting of two metals unequally expansible—

such as platinum and silver. The spiral is preferably very minute, so as to be well covered by the image of a body of moderate dimensions. Dimensions which have been found suitable for the spiral are as follows: The bimetallic strip from which the spiral was to be formed had a length of about 1 centimetre, a breadth of one millimetre, and a thickness of 0·02 millimetre. The spiral is to be coated with a substance such as lamp-black, which absorbs radiation falling upon it. It has its inner extremity soldered to a small rod E, of a metal (such as silver or copper) which has a high conductivity for heat; and the rod is, in turn, fixed to a plate F, to which is attached an index or pointer G. The plate is blackened on the side presented towards the spiral, and brightly polished on the opposite side. The radiation which penetrates between the turns of the spiral is thus received either by the turns or by the plate F, which imparts heat by conduction to the spiral. The outer extremity of the spiral is firmly attached to a slender support H—preferably of a substance of low thermal conductivity, like German silver. The object of mounting the spiral in this way is to secure, under given radiation conditions, the greatest possible rise of temperature.

The index G can move over a suitably graduated arc I, to indicate the temperature of the spiral and enable a calculation of the temperature of the hot body to be made in accordance with the known laws of radiation. It is preferred to graduate the arc so that the temperature of the hot body under examination is read off directly without the need for calculation. For the purpose of effecting such a graduation of the arc substances having known melting points may be made use of, or the pyrometer may be compared with a standard pyrometer.

The apparatus is completed by an eye-piece J, and has thus the form of a telescope. By looking through the eye-piece, the observer is enabled to judge when the instrument is correctly sighted and focussed, and at the same time to read off the required temperature upon the graduated arc.

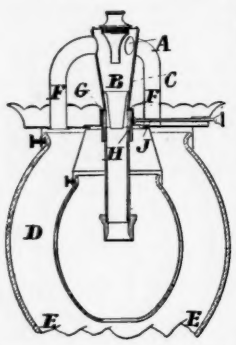
In order to eliminate errors which might otherwise arise from changes in the temperature of the apparatus as a whole, an adjustment is provided whereby a small displacement can be given to the graduated arc I. The observer is thus able to ensure that when no appreciable radiant energy enters the telescope the reading of the index G upon the arc I is neither too high nor too low. Or, instead of making the arc I adjustable, the support carrying the index G may be made adjustable.

Incandescent Gas-Lamps.

PRICE, C. W., of Holloway, N.

No. 2510; Jan. 31, 1907.

This incandescent gas-lamp is a modification of patent No. 2369 of 1906, wherein the air which mixes with the gas in the bunsen burner is drawn from a globe surrounding the mantle, and attached practically air-tight to the underside of a cover or plate through which tubes or passages lead to the air inlet apertures of the mixing-chamber of the burner—the upper portions of the tubes being each provided with a plug adapted to control the passage of air.



Price's Inverted Gas-Burner.

According to the present invention, the air-inlet apertures A are formed in the mixing-chamber B, which is surrounded by a sleeve C, in which are apertures (corresponding to the apertures A) communicating with a space D, within the globe E, by tubes F. The sleeve is supported upon a collar or shoulder G extending around the mixing-chamber, and is capable of rotary adjustment in relation to the chamber, so as to more or less close the inlet apertures as required.

The sleeve is formed with a slot H for the reception of a rod J, which passes through it and is screwed into a tapped hole in the shoulder of the mixing-chamber. The outer end of the rod extends beyond the side of the lamp, so that it can be manipulated. On the inner end of the rod is a head-like shoulder or collar, between which and the outer wall of the mixing-chamber the sleeve can be clamped by turning the rod in the required direction.

APPLICATIONS FOR LETTERS PATENT.

342A.—CLARKE, CHAPMAN, AND CO., LTD., and ROBSON, J., "Combined gas-producer and ammonia or equivalent generator." June 7.

342B.—CLARKE, CHAPMAN, AND CO., LTD., and ROBSON, J., "Combined internal combustion engine and ammonia or equivalent engine." June 7.

12,758.—PRIOR, A., "Gas-boilers." June 3.

12,809.—CLAYTON, L., and PICKERING, J. R., "Gasholders." June 3.

12,814.—PRYOR, E. L., "Gas-grillers." June 3.

12,823.—WILLIAMS, H. W., "Gas-purifier." June 3.

12,857.—TONRY, J., "Gas-fittings." June 3.

12,906.—GRIFFITHS, W. H., "Gas-turbines." June 4.

12,917.—RADFORD, R. H., "Mechanically screening and loading coke." A communication from Dillinger Fabrik Gelochter Bleche Franz Meguin and Co. Act.-Ges. June 4.

12,924.—BOWES, E. W., "Inverted burners." June 4.

13,003.—WATSON, M., "Gas-ovens." June 5.

13,037.—WILLIAMS, E., "Globe holders." June 5.

13,105.—FOGG, F. G., "Generating producer gas." June 6.

13,149.—TERRELL, T., "Mantles." June 6.

13,158.—OSMOND, G. E., "Gas-burners." June 6.

13,161.—SCHMIDT, P., and DESGRAZ, A., "Gas-producers." June 6.

13,217.—PHILLIPS, E., "Screwless globe holder for inverted burners." June 7.

13,300.—REES, C., "Lowering and raising lamps." June 8.

13,343.—WILLS, E., and KNOTT, F., "Vibrating mantle spring." June 8.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

Mond Gas in South Staffordshire.

SIR,—Our attention has been called to the article "Gas or Ammonia," in your issue of 21st ult., which was evidently written under a misapprehension, and no doubt you will be glad to receive further information upon the subject.

We should not have commented upon this matter had it not been that your article pointedly refers to Mond gas and this Company as follows: "Mond gas producers carbonize coal for the production of ammonia, and incidentally make a large quantity of very inferior gas." The article further claims that the researches by Dr. Bone and Mr. Wheeler—detailed in their paper read before the Iron and Steel Institute last month—confirm the above statement, and that gas made under the ordinary working conditions of a Mond gas plant "is emphatically condemned by Dr. Bone and Mr. Wheeler on account of its poor value as fuel;" and, further, "that the owners of works in Staffordshire who refuse to avail themselves of the Mond gas which is brought to their doors are accordingly shown to have better judgment than the Directors of the local Mond Gas Company credit them with."

All producer gas is acknowledged to be of inferior quality as compared with lighting gas, coke-oven gas, or natural gas; and it is no doubt in this sense that you refer to Mond gas as being "very inferior gas." This Company is established to supply Mond gas—the sulphate of ammonia being a bye-product; and our plant is operated in such a manner that we obtain not only the maximum amount of good gas, but also the maximum amount of sulphate of ammonia producible by our fuels. The gas is tested continuously day and night; and the average calorific value of over a thousand daily tests (from the 1st of October, 1905, to the 31st of May, 1907) of the gas as it leaves these works is 148·1 B.Th.U. per cubic foot at 15° C. We state emphatically that this calorific value is high for a producer gas, and shows our gas to be exceptionally good in this respect. Further, our gas is of more uniform quality than that obtained from any private producer plant. Indeed, tests made by Professor Burstall on the calorific value of lighting gas supplied in our area, show a larger variation—thus proving our supply to be more regular than that from illuminating gas works.

We have tested the gas made by several producer plants—both anthracite and bituminous—in this district, and find the calorific value of anthracite gas varies from 93·1 to 149 B.Th.U., and that from bituminous fuel to be about 125 B.Th.U. per cubic foot (all at 15° C.). These results were obtained during tests carried out under ordinary working conditions to the satisfaction of the firms interested, and prove conclusively that the gas supplied by this Company is far more regular in quality, and of a higher calorific value, than gas made in ordinary producers.

We are now supplying gas to six firms who have shut down their own pressure producer-gas plants, and to five other firms who have shut down suction-gas plants, and are putting in connections to shut down suction plants at three other works. We are overcoming the prejudice and opposition with which we have met, and manufacturers are realizing that considerable economies are being derived by those using our gas for both power and heating purposes.

Our gas is now supplied for 23 distinct industries, covering power and heating operations of the most varied types. So far as customers are concerned, our progress is now more rapid than at any time since we commenced operations; and during the last 18 months the number of consumers has increased almost 400 per cent.

The above facts disprove your statement that "the gas is so indifferent in quality that it is spurned and rejected by prospective buyers," and demonstrate, on the contrary, that the gas supplied from this central station is a producer gas of high calorific value, and well suited to the requirements of the local industries.

THE SOUTH STAFFORDSHIRE MOND GAS (POWER AND HEATING) COMPANY,
Per WILLIAM H. CARDER, Secretary.

Dudley Port, June 13, 1907.

Public Lighting at Enfield.

The question of whether gas or electricity should be adopted for the lighting of the public streets, came before the Enfield Urban District Council at their meeting last Wednesday night. A Sub-Committee reported having interviewed two of the Directors of the Gas Company, when the following terms were offered: (*a*) The charge per lamp to be reduced to £3 4s. 6d.; (*b*) the contract to cover a period of five years; (*c*) in the event of the charge for gas to ordinary consumers being reduced in the period covered by the contract, a proportionate reduction to be made in the charge for the street-lamps; (*d*) the Council to have power to exclude from the contract at the expiration of the first year or afterwards at their discretion, 15 per cent. of the lamps, 45 of which shall be No. 4 burners. The Sub-Committee also obtained quotations from the North Metropolitan Electrical Power Distribution Company for arc and incandescent lamps; and the Clerk was subsequently instructed to write to the Company to the effect that if they would reduce the price of the 50-candle power lights (two 25-candle Tantalum lamps) from £3 10s. to £3, and the 60-candle power lights (two 30-candle Osmium lamps) from £3 15s. to £3 4s., the Committee would be prepared to recommend that the Council have 80 of one or other of the lights for a period of one year. The Company replied that, owing to the short period and small number of lamps required, they could not see their way to reduce the price as suggested. The Committee therefore recommended that a contract should be entered into with the Gas Company on the terms mentioned. An amendment was proposed that a quotation should be obtained from the Electrical Company for one quarter of the lighting of the district. In the course of the discussion, it was pointed out that, if the amendment were carried, the Gas Company might alter their terms. The price formerly paid had been £3 18s. 7d. per lamp. The recommendation of the Committee was adopted.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following further progress has been made with Bills:—

Bills read a second time and committed: King's Norton and Northfield Urban District Council Bill, Kingston-upon-Hull Corporation Bill, Leeds Corporation Bill, Penrith Urban District Council Bill.

Bills reported, with amendments: Birkenhead Corporation Water Bill, Boston Spa Gas Bill, Brockenhurst Gas Bill, Colne Valley Water Bill, Gas and Water Orders Confirmation Bill (No. 1), Shanklin Gas Bill, Sheffield Corporation Bill.

Bills read the third time and passed: Birkenhead Corporation Water Bill, Boston Spa Gas Bill, Brockenhurst Gas Bill, Keswick Urban District Council (Water) Bill, Renfrewshire Upper District (Eastwood and Mearns) Water Bill, Shanklin Gas Bill, Sheffield Corporation Bill, Wisbech Water Bill.

The Annfield Plain and District Gas Bill, Broadstairs and St. Peter's Urban District Water Bill, Kingston-upon-Hull Corporation Bill, and Worthing Gas Bill were referred to a Select Committee, consisting of Viscount Hutchinson (Chairman), the Earl of Abingdon, the Earl of Morley, Lord Oriel, and Lord Bowes; and the Committee commenced sitting on the 12th inst.

A petition against the Gas and Water Orders Confirmation Bill (No. 2) has been presented by the Metropolitan Water Board in respect of the Herts and Essex Water Order.

HOUSE OF COMMONS.

The following further progress has been made with Bills:—

Bills brought from the Lords, read the first time, and referred to the Examiners: Birkenhead Corporation Water Bill, Sheffield Corporation Bill, Renfrewshire Upper District (Eastwood and Mearns) Water Bill, Wisbech Water Bill.

Lords Bills read a second time and committed: Ashton-under-Lyne, Stalybridge, and Dukinfield (District) Water-Works Bill, Heywood and Middleton Water Board Bill, Pontypridd Urban District Council Bill, Selsey Water Bill, Southport, Birkdale, and West Lancashire Water Board Bill.

Lords Bills reported, with amendments: St. Neot's Urban District Council Bill, Southend Water Bill.

A petition against the Ashton-under-Lyne, Stalybridge, and Dukinfield (District) Water-Works Bill has been presented by the Corporation of Mossley; and against the Coventry Corporation Water Bill by the North Warwickshire Water Company.

The Great Yarmouth Water-Works and Lowestoft Water and Gas Bill, Selsey Water Bill, Southport, Birkdale, and West Lancashire Water Board Bill, Tees Valley Water (Consolidation) Bill, and Tynemouth Corporation (Water) Bill [Lords Bills] have been referred to a Select Committee, consisting of Sir Joseph Leese (Chairman), Colonel Ivor Philipps, Colonel C. E. Warde, and Sir Walter Nugent; to meet to-day.

WORTHING GAS BILL.

House of Lords Committee.—Wednesday, June 12.

(*Before Lord* DONOUGHMORE, *Chairman*, *Lord* BOWES, *Lord* ABINGDON, *Earl* MORLEY, *and Viscount* MASSEREENE)

The object of this Bill is to authorize the Worthing Gas Company to acquire by agreement certain lands for the purpose of extending, and eventually the removal of, their gas-works. It was also proposed to extend the limits of supply, &c.

Mr. E. HONORATUS LLOYD, K.C., Mr. TALBOT, K.C., and Mr. B. K. R. WILKINSON appeared for the promoters; and the Hon. J. D. FITZGERALD, K.C., Mr. RAM, K.C., and Mr. A. F. PART represented the Goring Parish Council, landowners in Goring, and the East Preston Rural District Council.

Mr. HONORATUS LLOYD, in opening, said the only matter that was opposed was as to the extension of the limits of supply and the acquisition by agreement of lands. Difficulties had been placed in the way of the Company from time to time. But in 1904 an opportunity arose of their buying 2½ acres of land adjoining their works; and the Corporation approved of the proposal to use the land for the manufacture and storage of gas. They hoped that this was going to solve their difficulties; but the residents objected that the time had come for the removal of the works from the centre of the town to some more remote spot. The result of the local inquiry was that the inspector reported adversely, and the Board of Trade refused the application. Therefore the Company now proposed to acquire a site in Goring—a village to the west of Worthing; but, again, they were opposed. The Goring opponents said the Company could get a site east of Worthing; but he would show that the land to the east was unsuitable.

Mr. *H. Gardner*, the Chairman of the Company, said their business had extended so enormously that they were bound to get another site. The proposed site was the only one that they had been able to fix upon.

Mr. RAM, in cross-examination: You are asking Goring to tolerate a nuisance that will not be tolerated by your own people, although they have the advantage of the gas?

Witness admitted this, but said that the circumstances were altogether different in Worthing. He agreed that they had considered the possibility of staying where they were if they erected water-gas plant; but they objected to this.

In re-examination, witness said they proposed to include Goring within their limits of supply; and no doubt they would soon become customers.

Mr. *W. A. Walker*, the Manager of the Company, spoke as to the unsuitability of the suggested sites to the east of Worthing. Borings were made, and it was found that there were 15 feet of running sand before clay was reached. There was also danger of flooding from the adjoining land. There was great objection to laying pipes in a water-logged district. It was proposed to connect the site mentioned in the Bill with the present works by a high-pressure main. This would cost about £6000, including a return main.

Mr. *Joseph Cash*, the Engineer to the Brighton and Hove Gas Company, said it was essential that buildings of the weight of gas-works should have a solid foundation. He had examined various sites to the east of Worthing; but had found none that was suitable and available.

Thursday, June 13.

Mr. *R. F. Duke*, F.G.S, gave evidence as to one of the sites suggested by the opponents of the Bill at a place named Ham Fields. It was a site with a capping of subsoil, and with sand charged with water to a depth of 15 feet; and then the tertiary clays were met underneath. The result of the boring was that they found the timbering in the sump in a collapsed condition. The land to the north was marshy or brook-land. On another suggested site, Little Chesswood Farm, they found running sand under the subsoil; and it would not stand open of its own accord. The sites in the locality were decidedly unsuitable for underground building. At the site proposed by the Bill, the stratum was excellent.

Mr. *Charles Morgan*, the Engineer of the London, Brighton, and South Coast Railway, also spoke as to the unsuitability of the sites suggested and the excellence of that at Goring—especially from the point of view of siding accommodation.

Mr. *Corbet Woodall* said he thought the decision of the Board of Trade was a very unfortunate one in refusing permission to extend the gas-works on the present site. He had inspected various suggested new sites since the Bill was in the Commons; and, judging from what he had seen and heard, he was of opinion that they were unsuitable. The site proposed by the Bill was singularly free from objection. For the purposes of gas-works, it was admirable; and it had an excellent facility for railway connection. It was only where gas-works were crowded upon a small site that the tendency to smell, smoke, and steam was experienced; but from month to month the process of gas making was being improved in the direction of eliminating the smell and steam which were sometimes complained of. The use of lime had been discontinued. Gas was now purified entirely by oxide of iron; and from this there was hardly any smell—at any rate, none that could be appreciated except upon the works. The process of carbonizing coal was being conducted now to a large extent in such a manner as to diminish the smoke which used to proceed from the retort-houses. He thought that gas-works at Goring would have a tendency to increase rather than diminish the value of property in the neighbourhood.

Sir *George Livesey* said he had had rather an extensive experience of gas-works built on a substratum of running sand below the soil; and unless they could get below the running sand to drain it, it was an insuperable difficulty. If sand was dry, it was the best of foundations, but if wet, it was the worst. Here they had clay underneath; and they could not get below it to drain it. He corroborated Mr. Woodall's evidence as to the difference in the nuisances created since the abolition of the use of lime for purification.

Mr. *Charles Hunt*, Mr. *J. G. King*, contractor, Worthing, Mr. *C. E. Francis*, a resident of East Worthing, Mr. *J. Elliott*, well sinker, Worthing, Mr. *O. Wyatt*, auctioneer and surveyor, Chichester, Mr. *J. S. Baker*, fruit grower, Goring, Mr. *G. E. Evans*, solicitor, Worthing, and Mr. *T. Bushby*, Worthing, then gave evidence.

Major *E. W. Margesson*, whose father is part owner of the site proposed by the Bill, appeared for the opponents, and said the erection of gas-works at Goring would be detrimental to his father's estate.

Mr. *F. Somerset*, of Goring, Mr. *E. M. Rodocanachi*, of Worthing, and Mr. *P. E. Schweder*, of Goring, stated their objections to the Bill from the local point of view.

Mr. *W. R. Peck*, of Messrs. Hampton and Sons, property agents, said that the proposed site seemed to him to be the most unsuitable that could possibly be chosen. The gas-works would do harm there, but could not do harm if erected on sites to the east of the town.

Mr. *A. Shelley*, Mr. *J. I. Boger*, and Mr. *G. Wheatley* gave further local evidence.

Friday, June 14.

Mr. *C. B. Cook*, surveyor, Worthing, said that the gas-works would undoubtedly depreciate the property in Goring. Giving evidence as to the borings on the suggested alternative site, he said that the sand maintained itself as they bored down.

Mr. *E. H. Stevenson* said the Ham Fields site appeared to be one which could be used without any very great expense in foundations. Boreholes were put down, and it was found that the clay was above the level of the stream. There was water in the sand; but there was no such thing as running sand there at all. There was no doubt a good foundation could be reached at a reasonable depth there. He had put down gas-works on what he considered worse sites than this, and not at any extravagant cost for foundations. He also described other sites to the east of Worthing as being perfectly suitable.

Mr. *W. Mansfield*, builder, and Mr. *H. E. Jones* also gave evidence.

Counsel then addressed the Committee, who afterwards decided to allow the Bill to proceed.

Mr. FITZGERALD asked if the Committee had decided whether they would insert a compensation clause.

The CHAIRMAN: But it is an alteration of the general law, and Committees are very chary about altering the general law.

Mr. FITZGERALD: I think I can satisfy you it is not an alteration of the general law. I will bring up a clause. It would only be an alteration of the general law if I were proposing to change any provision in

the Gas-Works Clauses Act. That Act has proceeded on the basis that no damage is done, because no compulsory powers are given in the Gas-Works Clauses Act. It has proceeded on the basis that the Committee before whom the case comes are satisfied that it is a suitable site for a gas-works, and that no damage will be done. They are prohibited from creating a nuisance; and that is all. If, independently of that, the Committee come to the opinion that it is probable that damage may be done by the user of the gas-works, then, I submit, it is a proper case for compensation.

The CHAIRMAN: I do not think we would have given them the site if we had thought that.

Mr. FITZGERALD: But if it is reasonably possible that damage will be done, who ought to suffer the damage? Ought the damage to fall on the innocent landowner who adjoins, or on the Company who do the damage?

The CHAIRMAN: I think you have been trying for three days to persuade us that damage will fall on the innocent landowner, and we have decided against it.

Other clauses having been adjusted, the Bill was ordered to be reported.

METROPOLITAN WATER BOARD (CHARGES, &c.) BILL.

(*Before Viscount* CROSS, *Chairman, the Marquis of* WINCHESTER, *Earl* MANVERS, *Lord* ABERDARE, *Viscount* RIDLEY, *Sir* J. RANDLES, *Mr.* ROSE, *Mr.* WHITBREAD, *Mr.* DUNCAN, *and Mr.* LUKE WAITE.)

The Joint Committee of the Houses of Lords and Commons proceeded on the 6th inst. with the consideration of clauses of this Bill (see *ante*, pp. 464, 594).

The Hon. J. D. FITZGERALD, K.C., Mr. HONORATUS LLOYD, K.C., Mr. COURTHOPE MUNROE, and the Hon. E. CHARTERIS were Counsel for the Bill, against which there were a large number of petitioners.

Mr. FITZGERALD mentioned that in the amendments sent in by the promoters they had left clause 9 of the Bill, which dealt with the 5 per cent. charge, exactly as it stood. If this clause remained as it was in the Bill, it would, of course, be open to the Board to make a differential rate if they thought it desirable to do so. All, or almost all, water authorities had this power; and the case mentioned by Mr. Pilling when giving evidence (*Northampton v. Ellen*) showed that the power could be legally exercised by making a differential rate. If it was the intention of the Committee that a differential rate was not to be made, but that, in like circumstances, a 5 per cent., or a lesser, rate was always to be charged equally, then it would be necessary to make some addition to clause 9. The Treasury had sent in to the promoters a number of amendments which they desired to be carried into the Bill. As to one or some of these amendments they were prepared to assent to them; but as to others, the Board felt that they could not assent unless the Committee decided that they were proper amendments to be inserted.

Sir RALPH LITTLER said that, with regard to the City opposition, subject to a small amendment, they were fairly content with the proposal made.

Mr. WEDDERBURN said they had hoped that the Board would meet the traders; and the latter appointed a Committee with full power to agree as to the matter. The Board had never met them with anybody who had power to agree anything. He asked the Committee to further indicate what their view on the question of the price of trade water should be, and also whether an endeavour ought to be made to come to some agreement.

Mr. FITZGERALD said the amendment with regard to trade supply arose on these amendments, and could not be dealt with at once.

Mr. WEDDERBURN subsequently, after a conference, announced that nothing had yet been achieved between the Board and the traders.

The CHAIRMAN said the Committee accepted words suggested by Mr. Fitzgerald in regard to clause 9, that the rate should be uniform, "and such rate shall, subject to the provisions of this Act, be charged uniformly under like circumstances to all consumers entitled to such supply."

After a number of clauses had been discussed,

Mr. FITZGERALD, on clause 11, said words had been agreed to be added as follows: "Subject to foregoing provisions, the Water-Rate Definition Act, 1885, shall extend and apply throughout the limits of supply;" and in construction the words "rateable value" are to be substituted for "annual value."

Mr. RAM [Lord Aberdare being then in the chair] brought up the question and a clause with regard to the Temple and hospitals, which had been left over. The clause was as follows:

All the hospitals within the limits of supply shall, so long as they respectively continue to be occupied or used for the purpose of hospitals, be entitled to have a sufficient supply of water free and exempt from the rates and charges authorized to be assessed and levied under the provisions of this Act, and such supply, except as to payment, shall in all respects be treated as a supply for domestic purposes under this Act, and be subject to the provisions and regulations relating thereto, provided always that any expense incurred in conveying the supply of water from the pipes of the Board to the hospital shall be borne and paid by such hospital. For the purpose of this section the expression "hospital" means any hospital, infirmary, or other institution for the care or treatment of persons suffering from any bodily injury, infirmity, or illness, or any mental infirmity, not carried on for purposes of private profit or gain, and supported wholly or in part by endowments or voluntary contributions.

Counsel explained that to enable the clause to form part of the Bill he would ask later on that the word "hospital" might be excepted from section 14.

Mr. FITZGERALD said the question which arose here was whether a hospital should have a free supply or not. The matter under clause 14 was quite different—viz., whether hospitals should be struck out of this clause or not.

The Hon. *Sydney Holland*, a member of the Central Hospitals Council of London, and Chairman of the London Hospital, Mr. *J. G. Wainwright*, the Treasurer of St. Thomas's Hospital, and Mr. *Charles Burt*, an ex-Chairman of the Central Hospital Council for London, having given evidence,

The CHAIRMAN, after the Committee had deliberated, announced that they were agreed the clause should not stand part of the Bill.

Mr. RAM then proceeded with the cases of the Inner and Middle Temples, asking for the following new clause:

Notwithstanding anything in this Act contained, the Board shall provide and keep constantly laid on, unless prevented by frost, unusual drought, or other unavoidable accident, or during necessary repairs, a sufficient supply of water in bulk to the places respectively known as the Inner Temple and Middle Temple for distribution in those places. The water to be so supplied shall be paid for by meter half-yearly by the Treasurer and Masters of the Bench for the time being of the Honourable Society of the Inner Temple or the Middle Temple respectively to whose district the same is supplied at the scale rate for the time being current throughout the Board's area for a supply for other than domestic purposes, provided that no half-yearly payment of the Honourable Society of the Inner Temple shall be less than £310, and no half-yearly payment of the Honourable Society of the Middle Temple shall be less than £260. [These are the figures paid to-day.] In the event of any supply of water being required for the extinction of fire, such supply shall be given by the Board free of charge to the said Societies, or either of them; and the amount so supplied in respect of which no charge is to be made as aforesaid shall be ascertained by agreement between the Surveyor of such Societies, or either of them, and the Surveyor of the Board; or, failing agreement, by an arbitrator to be appointed by the President of the Institute of Surveyors.

If the clause was not passed, they would be charged on the rateable value as though they were having a domestic supply; and he proposed to show that the circumstances of the Temples were wholly peculiar. They were not within any parish. The two bodies were the owners of the pipes laid in the Temples; they had to maintain the pipes and relay them; and they were practically in the position of an authority who received a supply of water in bulk and served it to their tenants.

Mr. *J. W. Waldron*, the Sub-Treasurer of the Middle Temple, having given evidence,

Mr. RAM said that, in asking for an exceptional clause, the circumstances were wholly exceptional. He did not base it on the fact of their having a Charter and certain rights; but he put it entirely upon the way in which the water had been supplied in the past, and must be supplied in the future. Instead of the water-pipes all through the Temple belonging to Water Companies or the Water Board, they were laid down by, and had been maintained from time to time by, the two Societies, who had not been rated for the different rates in the City, who had been a kind of little parish or arrangement of their own in the centre between London and Westminster—their rights having been respected year after year. The tenure of the chambers was something different to anything else at all. To put the charge for water in future on the rateable value would be putting a huge charge on the Inns. He asked the Committee to say that a supply by meter was the only way in which the position could be met.

Mr. FITZGERALD argued that there was really no case for special treatment with regard to the Temples. There was no difficulty in getting a supply on the ordinary terms. Replying to the Chairman, who asked whether they had not been able to come to an agreement as to a supply by meter, Counsel said that under clause 19 of the Bill there was no difficulty in making an agreement; but this was a different thing altogether. It was a compulsory clause.

Lord ABERDARE: The Committee are of one opinion, that the clause should not stand part of the Bill.

On clause 11A,

The CHAIRMAN stated that the Treasury had written that the insertion of a clause providing that, as regarded Government property, the value on which contributions in lieu of rates were given by the Treasury should, for the purposes of the Act, be deemed to be the rateable value.

Mr. FITZGERALD promised to bring up clause 11A to carry out the view of the Treasury.

On clause 14,

Mr. BLENNERHASSET moved an amendment, on behalf of the County Council, proposing to strike out the words "or to any common lodging house, barracks, workhouse, hospital, sanatorium, or other public institution or building;" the object being that the common lodging houses, hospitals, &c., should be supplied as for domestic purposes, and the principle at the foundation of the amendment was that as the water was used for domestic purposes it should be charged on the domestic rate.

After discussion and arguments,

The CHAIRMAN said the Committee were agreed that they would leave all the words in except "hospital and sanatorium;" it being understood that a proposal as to words would be made concerning them later.

On the resumption of the proceedings on the 10th inst.,

Mr. FITZGERALD moved, on clause 17, an amendment in order that it should read:

Nothing in this Act shall oblige the Board to deliver to any premises a supply of water for any purpose at a greater elevation than that which the Board could, under any enactment applicable to such premises and in force at the commencement of this Act, be required to deliver a supply for domestic purposes, nor at a greater elevation than that at which the Board can supply such premises by gravitation from the service reservoir from which the supply is furnished.

The whole arrangements of the London Water Companies, and of the Metropolitan Water Board, had been made upon the basis of the Special Acts of the old Companies, by which they were not obliged to deliver water above a certain height.

Mr. WEDDERBURN characterized the amendment as a strange and sudden proposal. It had nothing whatever to do with charges. It was a proposal to relieve the Board of their existing obligations.

Mr. BLENNERHASSETT said the County Council looked upon this matter as one of very great importance, especially as regarded the question of fire extinction. They thought the clause highly objectionable, and that the least they could demand was that there should be in the Bill an obligation placed on the Water Board to supply where they did, as a matter of fact, supply at the present time—that they should be actually compelled to do what they in practice did at present.

Mr. FITZGERALD argued that the clause placed the Board in the

same position as they were in at present, except with regard to the last part—that they were not to be under an obligation to deliver. The first part of the insertion was: "Nor to oblige the Board to deliver to any premises a supply of water for any purposes at a greater elevation than that to which the Board could, under any enactment applicable to such premises and in force at the commencement of this Act, be required to deliver a supply for domestic purposes." If the clause stopped there, it continued every one of the obligations.

On the understanding that the Water Board would strike out of the clause the words "for domestic purposes," the Committee decided that it should stand in the Bill.

On clause 19, respecting special agreements for trade supplies,

Mr. WEDDERBURN moved an amendment on behalf of the traders and the Chamber of Commerce providing that no preferential treatment should be accorded to any individual consumer of water, and that the terms and conditions upon which a supply was given, or agreed to be given, by the Board, should be the same under like circumstances to all consumers. He said they had had the same thing in regard to domestic supply.

Mr. HONORATUS LLOYD objected to the amendment. He suggested the words—"that the terms and conditions upon which a supply of water is given by the Board under this section shall be the same under like circumstances to all consumers."

After some further discussion, this amendment was accepted; and the clause was amended accordingly.

On clause 20, it was proposed by the London County Council—the amendment being supported by the traders, the Chamber of Commerce, and the Middlesex County Council—that water from hydrants for fire extinction should be included in domestic purposes.

Mr. BLENNERHASSETT, for the London County Council, contended that although the Board would lose upon the charge for hydrants, there would be compensation by their use saving the cost of water used by the Fire Brigade. If there was anything which ought to be included as a domestic purpose, it was this matter. On public grounds, and as regarded the consumption of water, he pressed on the Committee strongly that this question of fire extinction should be deleted from this provision.

Mr. FORBES LANKESTER and Mr. WEDDERBURN, on behalf of the City of London and the London Chamber of Commerce respectively, supported the amendment, as did also other Counsel.

Mr. HONORATUS LLOYD stated that although it was proposed to raise the domestic rate to some extent, it was not universal. The result was that there was a very large loss on the gross amount of the domestic rate received by the Board; and the proposal, which would have the effect of including water supply for fire extinction in domestic purposes, would further reduce the revenue of the Board by £10,000 a year. With reference to public mains, the Board were under obligation to keep them fully charged, sufficient for coping with fire—and that free of charge. They were now dealing with private appliances for fire extinction; and there were improved methods of dealing with fires on private premises, so that traders had been able to get enormous reductions in their premiums from fire insurance companies by providing such apparatus. He submitted, as a matter of public policy, that if those who owned and occupied these places desired to have methods of dealing with fire, it was only reasonable that they should pay for the supply of water which they took for fire extinction beyond the domestic rate.

The CHAIRMAN announced, after consultation, that the Committee had decided to leave the words as they stood in the Bill. The amendment was therefore rejected.

Clause 26 provided that the Board should not be required to supply water for trade purposes, if to do so would interfere with the sufficiency of the domestic supply.

After opposition by the traders, the Chamber of Commerce, and the Railway Companies, the Committee decided to retain the clause.

Clause 27 provided that the Board might recover rates and charges in the same manner as poor-rates are recovered. This was opposed by the London and the Middlesex County Councils and by traders; it being pointed out by Counsel that the proposal would allow a penalty of imprisonment in the event of a distress warrant failing to realize the required amount, and that it was an extension of the power of imprisonment for debt.

The CHAIRMAN stated that the Committee, after a conference, had decided to strike out the clause.

Mr. FITZGERALD brought up a new clause dealing with rebates, as follows:

> Where under the provisions of the section of this Act (of which the marginal note is "Domestic Supply and Charges") the Board furnish a supply of water for domestic purposes to any house, or part of a house, occupied as a separate tenement which is assessed to the poor-rate or other rate in which such last-mentioned rate is included in a sum exceeding £300 per annum, and is not charged with the payment of inhabited house duty, the Board shall make or allow from the water-rate payable in respect of such supply a rebate or discount of such amount (not being less than 20 per cent. or more than 30 per cent. of such water-rate) as the Board may from time to time determine; and such rebate or discount shall from time to time be made or allowed from the water-rate payable in respect of every such supply and at a uniform rate per cent.

After arguments of Counsel, a proviso was inserted to the effect that a consumer assessed at, or under, £300 should not, by reason of the rebate, pay more than a consumer assessed at over this amount.

On a new clause dealing with the supply of water by measure,

Mr. *A. B. Pilling*, the Clerk to the Water Board, was recalled, and stated that when the Committee adjourned after the previous sitting, they had endeavoured to try and arrange the matter with the traders and other people. A meeting took place between the representatives of the traders and of the Water Board at the offices of the Board's Parliamentary Agents—the Parliamentary Agents of the traders and the Chamber of Commerce being also present. The traders were called upon by the Bill to meet a deficiency of £52,000. The proposals they made at the conference were merely those which they had already put before the Joint Committee on the preamble—namely, that the trade high-service charges should be continued, and that the scale of hire for meters should also be readjusted in order to bring in a larger sum. The money which the traders told them they expected to get from trade high-service by continuing it was £27,000; but in reply to inquiries, they frankly admitted that they had very little material on which to make this estimate, and that they had really made a shot at it. He had since gone into the question; and it was found that they had overestimated their figure by, at the least, £10,000. One of the main objects of the Board giving the 5 per cent. all round rate was to get rid of these special high-service charges. The suggestion on the other side was that they should keep the 5 per cent. and keep the high-service charges. If their figures had been right, this would have given the Board £36,000 of the £52,000; but it involved the maintenance of a very high scale of service charges. Their estimate was £10,000 more than it should have been; so that, dropping out the meter hire, their proposals would only have given them £36,000 out of the £52,000. No other proposals were forthcoming. The Board on their part had been unable to advise any other means of raising the £52,000 than those suggested to the Committee. There was some discussion as to the unfairness of casting the whole of the loss of £52,000 on the back of the traders. The traders maintained that the loss should not be made good at their expense. He asked how they suggested the Board should make up whatever balance was not procured from trade. This, they said, was rather a matter for the Board than themselves; and therefore they had no proposal to make. It was not mentioned at the conference; but it was a fact that one of the effects of the Bill was to call upon householders owning houses above £200 to pay £108,759 towards the deficiency. A further meeting took place on the last day the Committee met, when the Committee suggested that they should endeavour to come to some agreement. They got no further, however, than a suggestion of £16,000 towards the total.

After cross-examination, witness stated, in re-examination, that supposing in the future there was a large surplus income earned by the Board, it would enable them to reduce the rate, subject to the provisions of the Act of 1902. He understood this was so if, notwithstanding the reduction, they were able to earn a sufficient surplus to make a payment to the sinking fund.

The proceedings were resumed on Tuesday, the 11th inst.—Lord Cross presiding.

Mr. *F. E. Harris*, the Comptroller to the Water Board, stated that up to March 31, 1905, their income amounted to £2,675,450, and the total expenditure to £2,685,000; leaving a deficiency of £9550. This was the first broken period from the appointed day up to March 31, 1905, practically nine months. The total income for 1905 to March 31, 1906, was £2,778,185, and the total expenditure was £2,766,348; leaving a surplus for the first complete year of £11,837. The accounts for the year ending March 31 last were not yet audited. They were practically complete; but he put forward approximate figures as follows: The total income was £2,863,000, and the total expenditure £2,829,000—surplus, £34,000. He had made an estimate of the income and expenditure of the Board for the current year ending March 31, 1908; and he suggested a total income of £2,906,000, and a total expenditure of £2,896,000, or a surplus of only £10,000 at the end of the year. The total expenditure for 1906-7 exceeded that for 1905-6 by £62,652, or 2·26 per cent., and the total estimated expenditure for 1907-8 exceeded that for 1906-7 by £67,000, or 2·23 per cent.; whereas the increase of income estimated for next year was only 1·5 per cent. The expenditure of the Board had increased in a greater ratio than their income—so much so that, notwithstanding the fact that they had had the advantage of the quinquennial re-assessment, the estimated surplus for the financial year to March 31 next would only be £10,000. It was clear also that there was no provision whatever made to repay the debt incurred by the Board in acquiring the undertakings, which was 47 millions sterling. If the traders' scale was to be accepted, with other matters mentioned, they would be landed in a deficiency at the end of the year of something over £50,000.

In cross-examination by Mr. WEDDERBURN, witness said the proposal was that the traders should make this amount up, without any remedy now or in the future. He sympathized to some extent with them. But, on the other hand, the cost of water to the Board was working out at about 8d.; and the scales in the Companies' Acts at the present time were, in his judgment, inapplicable to trade supplies to-day. In this respect the Board admitted that they failed to do what the Companies did, but not in every respect. He did not admit that the Bill was a public confession of failure.

In re examination, witness stated that he thought the traders were bearing their share of the burden, and no more. If they were to adopt for railways the railway scale as proposed, it would give them a less income from these supplies than they got at present.

Mr. *W. B. Bryan*, the Chief Engineer to the Board, said he attached great importance to the proviso to the clause that they should not be required to furnish a supply in any less quantity than 25,000 gallons in any quarter of a year, or in any greater quantity than 500,000 gallons in any day of 24 hours. The reason why the limit was of such great importance was that a supply of half-a-million gallons a day, which was equal to a supply for 20,000 people, might be asked for at some point in the country a great distance from the Board's works; and it would not be possible in many cases to give this supply unless a great length of time was afforded the Board to lay new mains and provide adequate machinery. He believed that under the Water-Works Clauses Act there was a limit of time within which the Board must supply water on application by intending consumers; and it was to get over this difficulty that he suggested the limit of half-a-million gallons at one place should be fixed. There would be no objection, if plenty of time were given, to furnish more water by agreement.

Answering Mr. PAGE, witness said the Gaslight and Coke Company and the War Department at Woolwich took more than half-a-million gallons a day. Three Railway Companies in London consumed over a million gallons a day on the average; but they took their supplies at a number of points, and there was no objection whatever to a railway company having far more than the half-a-million gallons a day provided it be not taken at one point. Even at one particular point it could be given; but it might involve some little time in laying new mains and putting more machinery down.

In reply to Mr. WEDDERBURN, witness said the Gaslight and Coke Company took 220 million gallons of water a year. This worked out at more than the half-a-million gallons a day. They took this all at

their works at Beckton from three different mains. They drew more from one main than they did from the other two.

Mr. WEDDERBURN: If you look at sub-section 2 as it now stands, the supply is the supply of the premises; and the clause provides that "The Board shall, at the request of any owner or occupier of any premises situate in, or adjoining, any street in which any main or service-pipe of the Board is, or shall be, laid, and who requires for use on such premises a supply of water." Therefore the supply to the premises at Beckton would be regarded as one supply?

Witness: No; I think two at Beckton. They have two separate premises—the chemical works, which take the bulk of the water, and the gas-works, a little farther on, which take the remainder.

Mr. FITZGERALD intimated that he was prepared to meet any existing case, and to put some words in at any rate providing that, where at the present time a supply exceeding half-a-million gallons a day was being given, the owner or occupier of the premises should be entitled to have that supply continued.

Mr. WEDDERBURN said that, of course, would meet the opposition of the Gaslight and Coke Company, and, he supposed, of the Railway Companies also.

Mr. Fitzgerald's offer was accepted on behalf of the Railway Companies and the Gaslight and Coke Company.

Evidence was given in support of the scale submitted by the associated traders, by Mr. *W. B. Keen*, Accountant; and Mr. *C. L. Morgan*, the Engineer to the London, Brighton, and South Coast Railway Company, in support of the proposals of the Railway Companies.

Mr. FITZGERALD, after speeches by Counsel, undertook to bring up an amendment to ensure a supply to schools.

The Committee decided to adopt the clause and scale submitted by the Board, subject to amendments to be agreed upon later.

The clause provided that the Board, by agreement, may supply water by measure for domestic or other purposes. At the request of the owner or occupier, in a street adjoining any street in which a main or service-pipe is laid, who requires a supply for other than domestic purposes by measure, the Board shall supply, by means of pipes and apparatus provided at the expense of the applicant, water at rates not exceeding the following for every 1000 gallons: Where the quarterly consumption of water does not exceed 25,000 gallons, 1s.; when exceeding 25,000 gallons and not exceeding 50,000 gallons, 11d.; exceeding 50,000 gallons and not exceeding 100,000 gallons, 10d.; exceeding 100,000 gallons and not exceeding 200,000 gallons, 9½d.; exceeding 200,000 gallons and not exceeding 500,000 gallons, 9d.; exceeding 500,000 gallons and not exceeding 1,000,000 gallons, 8½d.; exceeding 1,000,000 gallons and not exceeding 5,000,000 gallons, 8d.; and when exceeding 5 million gallons, 7d. A proviso was added that the Board shall not be required to furnish a less supply than 25,000 gallons a quarter, or in any greater quantity than 500,000 gallons in any day of 24 hours.

The clause dealing with the supply of water by measure again came up for consideration on the 12th inst.; and further amendments were made.

Mr. FITZGERALD said he proposed to bring up the following with regard to the proviso to cover the case of the Railway Companies:—

> Provided also that the whole of the water taken within any railway premises which form one area for railway purposes, and are connected otherwise than by the line of the Company, should be reckoned as one supply and chargeable accordingly, notwithstanding that the water may, in fact, be delivered thereat through two or more meter pipes or other necessary and proper instruments.

Counsel next submitted a proviso to meet the case of manufacturers—that the whole of the water furnished to any person within any premises which form one area for trade or manufacturing purposes shall be reckoned as one supply and chargeable accordingly, notwithstanding that the water may, in fact, be delivered thereat through two or more meter pipes or other necessary or proper instruments.

Mr. WEDDERBURN accepted the proposal, to save time.

Mr. FITZGERALD said he had promised to bring up another proviso to protect the manufacturers or traders who were receiving a supply of more than half-a-million gallons a day. He proposed to substitute for the proviso in the clause a new one—that the Board should be entitled to charge for any such supply a sum of not less than 25s. in any quarter of a year. This was to meet the claim from West Ham for school supply. The proviso further declared that the Board should not be required to furnish any such supply for hydraulic power or in any greater quantity than half-a-million gallons in any day of 24 hours, save to such consumers as might have during any day in the year ending March 31, 1907, received a supply in excess of half-a-million gallons, in which case the Board should, if required, continue to give such consumer a daily supply not exceeding the quantity so received.

After arguments, the above amendments were inserted; and the new clause was then ordered to stand part of the Bill.

Mr. HUTCHINSON submitted a new clause that, subject to the provisions of the Act relating to a supply of water by measure for trade purposes, the Board might, at their own instance, and should, at the request of any owner or occupier of any wharf or wharf premises situate in, or adjoining, any street in which any main or service-pipe of the Board was, or should be, laid, and who required a supply of water for the purpose of the trade or business in connection with it, afford a supply of water by measure. He argued that a supply of water to a wharf or wharf premises was in no sense a domestic supply. It was given for the purposes of the exercise of the trade or business which was carried on there; and if it was said that because some of this water was used for sanitary purposes, or drinking or lavatory purposes, made it a domestic supply, the same argument would apply to the whole of the water supplied to a factory, because a portion of it was used for identically the same purposes.

The Committee, after a conference, decided that they would not accept the clause.

A clause proposed by the Water Board was agreed to by the Committee, as follows:—

> Any builder being about to erect any building, or part of a building, who shall require a supply of water for that purpose, shall be deemed to be the occupier of premises within the meaning, and for the purposes, of the section of this Act relating to the supply by measure. Provided that if the Board so determine they may, instead of affording the required supply by measure, afford the same at a rate not exceeding 7s. per £100 of the probable cost, after making such allowance as the Board may think reasonable for decorative or iron or steel work not required for the use of water.

A new clause was agreed upon and inserted fixing a scale of meter-rents ranging from 1s. 6d. per quarter for a ¾-inch bore to 17s. 6d. for a 6-inch bore.

Mr. WEDDERBURN submitted a clause with regard to an appeal by the owner or occupier of premises to two Justices, to prevent, as he said, the Board being able to deal with the consumers in London in an autocratic way.

Mr. FITZGERALD, in opposing, declared that the effect of the clause would be to really hand over the administration of the water supply of London either to two Justices or to an arbitrator, at the wish of any individual consumer. Such a clause had never been inserted in any Water Act, nor he believed in any Act at all.

The CHAIRMAN announced that the Committee would not accept the clause.

A clause to protect the special provisions respecting Hertfordshire in the Act of 1902 was agreed to.

Subsequently discussion took place over a clause brought up by Mr. RAM, dealing with the water supply to the Inner and Middle Temples. After a conference in private,

Lord ABERDARE, who presided during the arguments in this special matter, stated that the Committee felt they could not accept the clause; but they thought the circumstances were exceptional, and hoped the parties would come to some agreement.

Mr. FITZGERALD replied that the Board would endeavour to see what agreement it was possible to come to; and he hoped they would be able to agree.

After other amendments had been made, the Committee agreed to postpone report pending the receipt of the approval of the Treasury to the clauses.

The clauses having been read and, as amended, agreed to, the preamble was passed.

Thursday, June 13.

On the resumption of the proceedings to-day, Lord ABERDARE presiding,

Mr. RAM raised again the case of the water supply to the Inner and Middle Temples. He had done all he could to come to terms with the promoters; but he was sorry to say they did not entertain any of the suggestions he had made. All he could do was to bring up a clause asking that water might be supplied to the Temples upon arbitration terms under the provisions of the Arbitration Act.

Mr. FITZGERALD objected to this course. His learned friend had brought up two clauses successively, and there had been two decisions against him by the Committee. It was obvious they could not come to an agreement of this kind in half-an-hour, having regard to the provisions of the Bill, which required that all agreements should be equal to all persons in like circumstances. As the Bill would not come into operation for a year, there was plenty of time to consider and negotiate any terms of agreement with the Inner and Middle Temples. He was authorized by the Board to make the following statement:—

> The Board have understood the decision of the Joint Committee to be that, whilst they do not direct the insertion of a clause, they nevertheless think that the Temples should receive some consideration. Assuming this to correctly represent the facts, the Board wish to suggest that the uniformity provisions which the Joint Committee have put into the Bill, especially that with reference to clause 19, the agreement clause, require the most careful consideration by the Board before the details of the proposed agreement with the Temples are settled, lest the Board should find that hasty action has committed them to the concession of the same terms to other consumers who do not now enjoy them. The cases of the other Inns of Court have already been cited in this connection; but there are other properties to be considered. For instance, Burlington Arcade is private property, the gates of which are closed against the public nightly, and the supply to the shops is afforded by a main running down the centre of the Arcade. Whilst, therefore, it is the desire of the Board, as indicated by the Committee, to give the Temple Societies the best possible terms, it is thought that the settlement of so important an agreement demands time for consideration in view of the fact that it may hereafter be held to have established an important precedent under the uniformity clauses; and as the Bill does not come into operation until April 1, 1908, some time must necessarily elapse before the present arrangement can be determined. In these circumstances it appears to the Board not unreasonable that due time should be given to the consideration of the terms of such agreement.

Counsel added that he did not see how the Water Board could be expected to go further than this.

Mr. RAM urged that the Temples should be protected, and pointed out that when they went to the Board there would be no appeal whatever. He only asked that, failing agreement, the matter might be settled by arbitration.

The Committee having conferred,

The CHAIRMAN said they were of opinion that if Mr. Fitzgerald's statement could be put on the notes, it was quite as much as they could ask the promoters to do.

The Committee then adjourned.

The Gas-Rate Question in New York.—Mr. Arthur H. Masten, the Referee appointed by the United States Circuit Court to take evidence in the action commenced by the Consolidated Gas Company of New York to have the enforcement of the Act fixing the price of gas at 80 c. per 1000 cubic feet declared unjust, has presented his report. The inquiry was opened on July 15, 1906, and it occupied 118 days. The Referee considers that the State acted unfairly in under-estimating the actual amount of capital invested in the business of the Company. The official valuation of the property on which the rate of 80 c. was based was $31,000,000, exclusive of franchise. The Referee reports that the property of the Company is worth $83,537,000, and that the actual cost of gas delivered at the consumer's burner is 65·84 c. instead of 48 63 c., as claimed by the City and State officials. It is understood that the case will be taken to the Supreme Court at Washington without delay.

LEGAL INTELLIGENCE.

SUPREME COURT OF JUDICATURE—COURT OF APPEAL.

Monday, June 10.

(*Before the* MASTER OF THE ROLLS, *the* PRESIDENT OF THE PROBATE, DIVORCE, AND ADMIRALTY DIVISION, *and Lord Justice* KENNEDY).

Cleverley (Widow) v. The Gaslight and Coke Company.

Mr. DANCKWERTS, K.C. (with him Mr. WILSON), said this was an appeal by the Gaslight and Coke Company against a decision of the Deputy-Judge of the Romford County Court. Cleverley met with an accident on Feb. 12, 1905, while working a hauler, which broke, causing him to fall and hurt his neck. As everyone assumed that the accident was the result of the fall, the usual agreement was made and filed in the County Court. In the following year Cleverley died. His death was not the result of the accident, nor was his death accelerated by the accident. But the Deputy County Court Judge found and held that he died as the result of the accident by estoppel. The way in which estoppel was found was this: The Judge said the agreement of March, 1905, was founded on the assumption that the man was incapacitated by the accident; but it had since come to light that he died from lympho-sarcoma. Even assuming that the agreement bound the Company to admit for ever afterwards that, in point of fact, the incapacity was due to the accident when the agreement was signed, this did not hinder them from saying at a later period that Cleverley was no longer suffering from the accident, or the result of the accident.

The PRESIDENT asked what was the exact estoppel relied upon.

Mr. DANCKWERTS said it was simply the ordinary agreement that the Company should pay the sum of 18s. per week so long as the incapacity lasted. There was nothing in the agreement which could create an estoppel in the event of death. The Company could come at any time and say the incapacity caused by the accident had ceased. Lympho-sarcoma was a malignant tumour of the glands, which had a tendency to paralyze the action of the heart; and the probability was the man was suffering from the disease at the time of the accident. But the Judge had not so found.

The MASTER OF THE ROLLS, interrupting Mr. Danckwerts, said the Court desired to hear Counsel for the respondent.

Mr. SHEARMAN, K.C. (with him Mr. FIRMINGER), said the finding came to this, that at the time of the accident the man was perfectly healthy, that he received a blow on the neck and soon after a swelling supervened, whereupon a claim was made under the Act. The Company then having two courses open to them—either to dispute or admit the case—admitted it; and instead of the matter going before the Court to try the question of liability, the agreement was entered into. The Judge found that the man died from the disease from which he was suffering when the award was made.

The MASTER OF THE ROLLS: The finding of fact is that the man did not die as the result of the accident. Putting it in the most favourable way for you, it cannot be said there was an estoppel, except in this sense that, the agreement having been filed, it was left open to the Company to review the agreement; and it would not then be open to them to say that the accident was not one for which they were liable. This is the utmost to which estoppel can go; but this is not an application under rule 8 to review.

Mr. SHEARMAN said the Judge had found that if the Company, instead of fighting, agreed that the incapacity was due to the accident, they could not afterwards say that death was not the result of the accident; and that was sufficient to carry him through. It was common ground that lympho-sarcoma might reasonably be caused by a blow.

The PRESIDENT: Suppose a man was suffering from a disease from which he must die, and then was injured and compensation was awarded, would you find any different wording in the agreement than in the one which has been registered?

Mr. SHEARMAN said he did not think he should. Estoppel having operated in his favour, he was relieved from proving that the injury was the cause of death.

The MASTER OF THE ROLLS said he was clearly of opinion that the doctrine of *res judicata* or estoppel did not apply in this case, and that it would have been open to the Company at any time to say the agreement ought to be varied or discharged, as what was a matter of belief at the time the agreement was made, which was dependent on expert evidence, had been shown to be due not to the accident, but to something else. Assuming this not to be so, at the utmost all that could be said on the point of estoppel was that the Company might have been estopped during the life of the workman from saying, on an application to review, that the accident was not the cause of the incapacity. But he failed to see what bearing this had on the present case, as it had no connection with the cause of death. This was a matter of fact which must be proved by evidence in the usual way. Here there was an express finding by the Judge that death was not the result of the accident; and therefore estoppel did not apply.

The other members of the Court concurred; and the appeal was allowed.

HIGH COURT OF JUSTICE—CHANCERY DIVISION.

Thursday, May 30.

(*Before Mr. Justice* SWINFEN EADY.)

Wombwell Urban District Council v. Dearne Valley Water Company.

The case for the plaintiffs having closed (see *ante*, p. 752), that for the Water Company was proceeded with.

Mr. ASTBURY said before calling his witnesses, he would briefly indicate the view he wished to submit. He admitted that the defendants agreed to deliver in bulk to the plaintiffs' predecessors sufficient water for their requirements (not limited to domestic purposes) at 6d. per 1000 gallons. Everything went on satisfactorily so long as Mr. Robinson held a dual position, being connected with both bodies. It was admitted by the agreement of Dec. 12, 1905, that down to that date the defendants had complied with the obligations under the original agreement; and the quantity of water then taken worked out at about 143,000 gallons per day, or 9 gallons per head. Until they got into the hands of his learned friends, the substantial point raised by the plaintiffs was that they were entitled to be supplied under pressure, which he submitted was an entire fallacy. On looking at the Water-Works' Clauses Act, the Company's Special Act, and the Provisional Order, which the plaintiffs relied on, he contended that it was quite obvious that the obligation to maintain a constant supply under pressure only applied as between the Company and their own ratepayers, and had no reference to the supply in bulk to a public authority, the power to do which was limited by a provision that it was not to interfere with the proper supply to the consumers within their own district. If the plaintiffs' contention was correct, this supply might be greatly interfered with, and the whole of the Company's operations disorganized. Assuming, then, that the defendants were not bound to deliver water under pressure, it was agreed that Four Lane Ends was the proper point at which the delivery should take place; and he agreed that the defendants were bound to furnish there such a quantity as was reasonable, but not necessarily from hour to hour. There was no evidence that the defendants had done anything to prevent the plaintiffs from taking, after Aug. 16, the same quantity of water as before, when it was admitted that their requirements were met. In fact, their own figures showed that from that day to the end of the month they took 2,561,000 gallons, or an average of 160,000 gallons per day, and in September they took an average of 148,000 gallons; whereas previously, to December, 1905, the average worked out at only 143,000 gallons. His evidence would show that the defendants had done nothing to prevent the plaintiffs from taking as much water as they wanted, and that in some cases it was even running to waste. When the case was adjourned, the defendants offered the fullest inspection of their works. But nothing had come of it. He should show that the pressure was never allowed to fall below 200 lbs. at the pump, since the valves had been fixed. Counsel quoted a number of figures from the tables, showing that recently much more water had been supplied than was required for daily consumption. Summing up, he said it was plain that about 143,000 gallons per day, as had been taken previously, was an ample supply; and it was only when, owing to the plaintiffs' own action, the defendants were compelled to shut off the pressure, that this question of being entitled to constant pressure was raised, and the case about a deficiency of supply was got up in order to support it. He justified this statement by quotations from the correspondence, and submitted that the plaintiffs had not made out any case.

Mr. *William Wilmot* was the first witness called for the defendants. He said he had been in charge of their pumping-station since October, 1904. There was a pressure-gauge on the rising main, and an indicator showing the height of the water in the Hoyland reservoir. These were constantly under his observation; and his instructions were to keep the pumps going so as to maintain the requisite pressure to keep the reservoir full. The maximum pressure was 225 lbs.; and they pumped at it till the tank was full, and then let it down. When the engine stopped, the pressure-gauge stood at 200 lbs.; and it remained so as long as there was water in the tank. He noted the pressures in a book. There had been drops of pressure at times; but with very few exceptions it stood at 200 or 225 lbs. On Whit Sunday he visited the Hemingfield reservoir and found it full; the Jump reservoir also was full, and the water running over into the sewer. The Roebuck tank was half full. He had been watching the Jump reservoir every day since, and found it always overflowing; and the previous Tuesday the Hemingfield reservoir was nearly full. He kept in a book a record of the hours the pump was at work. As soon as the tank was full, the pump was stopped. When the indicator showed 9 ft. 6 in., the pump was stopped. There was no drop of pressure so long as there was any water in the tank. The only pressures recorded in the book were 200 lbs. and 220 lbs. when he started and stopped. If there was a considerable leak in the main, the pressure would immediately fall, though the tank was not empty.

Friday, May 31.

The cross-examination of Mr. *Wilmot* was continued this morning, with the object of ascertaining the exact time the defendants' pumps were in operation; and it appeared that, on an average, it was about 12 or 13 hours a day. During April and May, the rams might have been working more hours on some days than previously; but he could not say from memory. It was all entered in his book.

Re-examined: During the whole time the rams were stopped in May last, the pressure-gauge stood at 200 lbs. On May 25, the rams were at work continuously for 24 hours. His instructions were to keep the Hoyland tank full; and he could re-start the ram when, the level fell to 4 ft. 6 in., or to 6, 7, or 8 feet as he had a mind. In 1906, it fell on one occasion as low as 2 feet, owing to an accident to the engine. The pressure was then 200 lbs. There were two bells which rang when the tank was full; and when the water fell to 4 ft. 6 in. they worked independently of the indicator.

Mr. *T. W. H. Mitchell* said that his firm had been Engineers to the defendant Company since 1880. They had two sources of supply—the pumping-station at Wombwell, and a certain amount of water they bought from Sheffield. The station was so arranged that when working at a pressure of 225 lbs. it would deliver water into the Hoyland reservoir. When the pump was stopped, the pressure would be 200 lbs. During the last six months of 1905, the average quantity supplied to the plaintiffs was 140,000 gallons a day (excluding Broomhill). Witness produced a number of tables which he had prepared showing the daily takings, pressures, &c. In the early part of last year, the defendants complained of the pipes which allowed the water to go straight into the plaintiffs' mains being used so as to get the pressure from defendants' pumps directed into their services. Before the valves were fixed in April, anyone could open them. The effect of this draught on their rising main was to lower the pressure at the pumping-station; and it was reported to him that the service was being disorganized. He gave instructions that the valves should be fixed; and this was

done on April 3 last year. In Mr. Robinson's time, the two bodies worked together, and the endeavour was to keep the Jump reservoir full, so as to avoid inequalities of pressure. In the early part of 1906, there were many meetings between plaintiffs and defendants with a view to coming to an amicable arrangement; but nothing could be done. Witness was a member of plaintiffs' Council; and at a meeting on the 10th of April, Mr. Elliott, the Chairman, said that the plaintiffs would enter the Jump reservoir, and put all the burden on the valves which were used when the reservoir was under repair, or words to that effect. He said this was the card they proposed to play. The reservoir was emptied and kept empty the whole year. Under these circumstances, the Company's service would have been disorganized, and the consumers would have suffered. He therefore had the valves fixed. In March, the plaintiffs could have taken as much water into their mains as they wanted. The quantity taken varied considerably; and nothing was done by the defendants to cause such fluctuation. On the 1st of August the pressure-reducing valve was put in, to prevent irregularities in the draught on the main, because the defendants' men never knew what to be doing with the pressure constantly varying. The pressure-valve was so fixed as to enable plaintiffs to take 186,000 gallons a day if they wished; and on Aug. 26 they took this quantity. Nothing was done to prevent the same amount being taken on other days. At Broomhill, the plaintiffs could take as much water as they required; and it worked out in 1905 to an average of about 6 gallons per head, including such small trade supply as there was. Later on the quantity went up to 13 and 14 gallons per head; but this was owing to a large trade supply. Having regard to the plaintiffs' mode of distribution and the quantities of water which had recently been taken, a good deal of which had been wasted, he considered 210,000 gallons per day much in excess of what was required.

Cross-examined: The defendant Company purchased 100,000 gallons of water per day from Sheffield to supplement their supply, and for it they paid 8d. per 1000 gallons. This water went into the Hoyland reservoir by gravitation; it was kept constantly on. There were great variations in the meter readings, in many cases accounted for by the outlet-valves being shut. Interference with valves on the inlet side, and a difference in pressure, would also account for the variations. He could not think of any other cause. He had not compared the particulars given of deficient supply with the times when the outlet-valve was shut owing to a stoppage of the engine. Witness's attention was called to several dates on which a considerable rise or fall in the quantity of water metered was contemporaneous with something being done to the valves; and he admitted that there must be some connection of cause and effect. With regard to the pressure in the main, he considered that it was steady, so long as it stood at 200 lbs. at the station. Between that point and Warren House, the Darfield supply was taken off by a 6-inch main. The gauge at Warren House, he admitted, gave an accurate record of the stopping of the engine at the station; and he could not say why it should be inaccurate when the engine was at work. Assuming it to be accurate, it showed variations in pressure; but he did not think they would affect the quantity of water passing the meter. On being pressed, he admitted that it might have a slight effect, but said it would be hardly appreciable. There were many complaints about deficiency of water in 1906; but he could not say that Mr. Elliott threatened to empty the Jump reservoir in consequence of the allegations on the part of the defendants that so long as there was water in it there could not be a failure in the supply on their part. He thought Mr. Elliott desired to "put the defendants about." Apart from this, he did not suggest that the plaintiffs had done anything dishonourable or improper with a view to aggravating the situation. In his opinion, the defendants gave a reasonable supply of water in August last. The adjoining districts, including Broomhill and Darfield, were getting much the same service, and complaints were made last year by the residents in both these places. In his opinion, a supply of about 140,000 gallons of water per day would be quite adequate for the supply of Wombwell.

Re-examined: The quantity taken between April 26 and May 18 averaged 142,000 gallons. The fluctuations in pressure were totally inexplicable.

Mr. *L. S. M. Marsh*, Water Engineer to the Corporation of Sheffield, said they supplied a large district outside the borough. There were many places similar in character to Wombwell; but he knew of none that took more than 10 gallons per head. Having regard to the defendants' obligations to their own consumers, it would be very difficult for them to supply water under pressure to the plaintiffs, if they had power to take varying quantities. Having inspected the defendants pumping-station, he was of opinion that, with the valves as now fixed, the pressure was sufficient to deliver 150,000 gallons per day at Four Lane Ends, so long as there was any water in the Hoyland reservoir. The only explanation he could suggest of the fluctuations in the pressure, as shown by the records taken at the Warren House, was the presence of air in the pipes, though this could hardly account for the whole of them. But he did not think the variations shown were due to the consumers at Darfield taking more water.

Saturday, June 1.

Mr. *Marsh*, in further examination this morning, said he inspected the plaintiffs' pumping-station, and thought the arrangements were not all that could be wished. The tank was very small; and he thought the engine was rather overworked—driven too fast. When he was there, he noticed that the water in the tank was low; he did not take the revolutions of the engine. Even if the plaintiffs did not get sufficient water, it would not improve matters to over-pump. It would be better to allow the tank to remain full and pump steadily, so as not to drawn in air. He gauged the water passing on one occasion for a quarter of an hour, and it was 3000 gallons. On a second visit, he noticed the same sort of thing—irregularity of pumping and lowering of the water in the tank. The Jump reservoir was practically empty, and the valves were closed, so that no water could enter. He was again there on the 6th of April; and then the engine was working better—more regularly. The inlet-valves were opened, and a large quantity of water ran into the tank, which overflowed. The storage in the two reservoirs was sufficient. They were larger than usual. Three days' supply was commonly allowed for service reservoirs; and these much exceeded this. He had compared the pressures at Warren House with those at the defendants' pumping-station, and the height at Hoyland. When the gauge registered 120 lbs., this was equal to a head of 279 feet, which, added to the elevation of 395 feet, made 674 feet, or 74 feet above Hoyland. When the gauge at the defendants' station showed 225 lbs., it equalled 523 feet, which, added to the elevation of 135 feet, made 658 feet, or 16 feet less than was shown at the gauge at the Warren House. This was probably caused by the velocity of the water in the small lead pipe 10 feet long leading from the service main to the gauge. The readings of the gauge were very high; and he thought the velocity of the water in the small pipe might account for this, and also for some of the fluctuations that were observed.

Cross-examined: The two large reservoirs were originally for storage; but they were now service reservoirs, and were ample for the purpose. With regard to the pumping arrangement, he considered they were temporary, but adequate—both engine and pumps. He did not know the speed of the engine; he thought it would have been better if the water in the tank had been kept at a steady level. On his first visit, on Jan. 24, he made notes. Mr. Taylor and Mr. Massey were present. The supply was at the rate of 8000 gallons per hour. On the second occasion (Feb. 1), he noticed nothing particular. If the water was flowing in and the engine working regularly, the water level ought to remain constant. If either varied, the level would vary; and if it fell too much, the pump would suck in air, which would have a further effect. The 6th of April was the first occasion on which he saw the tank overflow. There was an enormous increase in the volume flowing then, owing to the opening of the valve. He did not suggest that there had been any alteration in the pump or engine between his various visits; but the efficiency of the engine would depend on the quality of the gas, which might vary. Subject to this, he should say the apparatus was adequate. He had not directed his attention to the system of distribution. Eliminating this, and admitting that the storage and pumping apparatus were adequate, complaints could only arise from deficiency in the water supply. In Sheffield, for the year ending March, 1906, the consumption was just under 10·5 gallons per head; but it took them many years to arrive at this state of economy. Some years ago it was 30 gallons per head. The 10·5 gallons included water used for the flushing of sewers. The consumption in the summer varied to the amount of from 5 to 10 per cent. above the average. He still thought a demand of 13 9 gallons per head per day in August and September last was excessive. The Roebuck reservoir was 309 feet above the level of the defendants' pumping-station, which equalled 134 lbs. pressure. One of 130 lbs. pressure would not carry the water over the Roebuck Hill; so that if it sank below 134 lbs., the plaintiffs could not draw any water, and the fall must be due to some other cause. He did not think a fall to 110 lbs. could be due to anything the plaintiffs were doing. With regard to the pressure records at Warren House, he saw no reason to doubt that the gauge was working properly. Some of the fluctuations were very difficult to account for; and he was inclined to agree that air must have got into the pipe. After a good deal of technical discussion on these records, the witness said he agreed that any variation in pressure shown at Warren House would be to some extent aggravated at Four Lane Ends because it was nearer Hoyland.

Re-examined: There was a 10-inch main from the pumping-station to Hoyland, out of which there were three outgoing pipes—those at Four Lane Ends, Warren House, and the main to Darfield. If the water were suddenly taken away at Four Lane Ends, the effect would be to release the pressure from Hoyland, and it would be only that due to the difference of level between Four Lane Ends and the pumping-station. But this effect would only be temporary—probably momentary. If the Hoyland tank was empty, and there was no pumping, the flow of water at Four Lane Ends would very soon cease altogether. When he was at the plaintiffs' pumping-station on Jan. 24, he formed the opinion that the engine was going at a greater speed than could be maintained; and he gave instructions that it should be watched.

By Justice SWINFEN EADY: He could not account for the difference in the rate of flow between 6900 and 8400 gallons per hour in consecutive half hours on May 22, when both plaintiffs' and defendants' pumps were working regularly, unless there was some alteration in the valves, assuming the pressure was constant. A similar variation being pointed out on the following day, witness said that the only inference he could draw was that something must have been done to the valve controlling the meter.

Mr. *William Johnson*, the defendants' inspector, and formerly in the employ of the Local Board, described the method of supplying the water to the plaintiffs. He said originally the valves were entirely under his control; but in February or March of last year Mr. Burton complained of his interfering with certain valves, which he said belonged to plaintiffs. Soon after this he noticed great falls in pressure at the pumping-station, and began to investigate the matter. He found the water was taken very irregularly at Four Lane Ends; the valves being sometimes opened fully. On reporting the matter to Mr. Mitchell, he had instructions to partially close the valves, so as to allow a flow of 8000 gallons an hour into Jump reservoir; and he fixed them with a bar and gutta-percha. Some time afterwards, it was reported to him that the valves had been altered; and on inspecting them he found this was so, and he fixed them again. Later on, in September, in consequence of other complaints, he had the valve riveted. On Aug. 1, the pressure-reducing valve was put in. [Witness described the mode of doing it.] On several occasions this valve had to be attended to. On Aug. 21 he had a note in his book that the valve had been tampered with; and on looking at it, he found some bricks had been put on it. He took them off, and restored it to its original position. In October he again examined it, and found it jammed. He pressed down the lever, so as to give a proper flow. He thought the jamming was caused by the outlet-valves being suddenly closed. In December he again found the same thing, and once more released it. On March 28 it was again jammed; it was the same day that he changed the meter. After releasing the valve, he wedged it with a piece of wood, and, as far as he knew, it had never been jammed since.

Monday, June 3.

Witness was further examined this morning, when he narrated the various operations which had taken place at the valves and meters, including the putting in of new meters, because those which were replaced were losing. On some occasions he had found the outlet valves partially closed. On Oct. 25, for instance, he saw Middleton turn it off because the tank was overflowing, and shortly afterwards he turned it partly on. One could not tell by looking at the valve whether it was on full or not, only by counting the number of turns. He had never wedged the pressure valve with a brick, or given instructions for this to be done. He estimated the natural flow into Hemingfield at 8000 to 10,000 gallons per day, and 10,000 to 20,000 gallons in winter. He paid occasional visits to it, and several times noticed that the drain was blocked up and the water running away—on one occasion at the rate of 30,000 gallons a day. He read a number of notes from his memorandum book on this subject. The Hoyland tank had never been empty to his knowledge for the last two years. On April 3, 1906, he fixed the valve at Jump reservoir to allow 8000 gallons per hour to pass. On the 5th, he went to inspect, and found that for one half hour it was passing at that rate; but three other half hours showed much less. He attributed this to drawing water at a hydrant or fire plug; the valve must have been partly closed down by the pressure.

Cross-examined: He concluded that the valve was partly closed down from the pressure. When the meters were taken out, they were sent away to be tested, and found to be slow. He had not the report which was made upon them. The first change was on Aug. 1, 1906; and again on Aug. 21 a joint was blown out, the effect of which would be to let the water through without registration. This was repaired on the 22nd. The meters, &c., were constantly under supervision. He could not say when he first suspected they were not working properly; it would be shortly before Dec. 1, when a new 2-inch meter was put in; and on the 4th something was done to it. At that time the water passing averaged 115,000 gallons per day. On March 28, one new meter was put in; and in April both were replaced. The object of putting in the reducing valve on Aug. 1 was to equalize the pressure on the main. On Aug. 21, he found one of the joints of the meter had blown; and on examining the reducing valve he found the lever was weighted with bricks. The valve was jammed; but he did not know who did it. Later on he fixed it himself with a wooden wedge. The effect of releasing the valve was to lessen the flow rather than to increase it. In August there had been complaints of deficiency. He had no note of doing anything to the valve on August 30. He did not understand how it was that it was said that the Jump reservoir was empty during August and September, nor how sending water into the reservoir instead of into the mains would affect the drop in the quantity passing the meter. He had no note of ordering anything to be done to the valve on Sept. 2. When he fixed the valves in April, he made no record of the number of turns they were open, nor did he mark them. On Sept. 8, there was water in the Jump reservoir, up to the second outlet. He knew of the demand of the plaintiffs in August and September for a supply of 210,000 gallons per day; but he did not remember doing anything to the reducing valve in consequence, and had no note of it. There was an increase in the meter readings for several days after Sept. 15; then it gradually fell away again. On Oct. 2, he visited the pressure valve, and released it; but he did not fix it. It would have remained open if plaintiffs had not shut off the water. On Oct. 25, at 11 at night, he saw Middleton turn off the outlet valve, and the engine stopped. He had no note of the engine starting again. There was only one valve partially opened when he left. On Nov. 5, he saw the tank overflowing; and the valve was turned off by Wardle. On Dec. 26, he again released the pressure valve. Henry Johnson was with him; and tested the meters. Down to March 28, when the pressure valve was wedged, its action had not been satisfactory. He attributed this to the plaintiffs continually shutting off the water and jamming the valve. Since then there had been an increase in the supply. The other valves remained as they were on March 28, except on the day in April when experiments were made. During the recent vacation he had had hourly readings of the meters taken. The men who took them were not there the whole time; they had to go to the Roebuck and the Jump reservoirs to see the depth of the water. On two occasions only was any interference with the outlet valves during the time reported; and these were when the engine was stopped. Witness gave several of the meter readings, which it appeared were different from those of the plaintiffs on some occasions. It was his duty to remedy any defects of which complaint was made. There had been complaints from the Goldthorpe district; but not from the other part of Bolton. There was considerable shortage of water at Wombwell in August and September, 1906.

Re-examined: He lived himself in Nough Lane, in the higher part of the district. When he had been short of water himself, he had visited Jump reservoir and found water was accumulating there. The largest quantity of water he had seen there after April, 1906, was about 3 ft. 6 in., in November or December. During the whole of 1905 the Jump reservoir was substantially full, and the highest part of the district was supplied well at night; but in the daytime the lower districts took so much that the highest parts did not get it. Defendants had no control over the water after it got into the Jump reservoir. When the pressure valve jammed, it was owing to the sudden shutting off of the water by plaintiffs. He never ascertained who put the brick on the lever in the first place; all his own men disclaimed having done it.

Chas Crabtree, who said he had been seven years in the Company's employment, was next called, and corroborated the evidence of the last witness as to setting and fixing the valves. He remembered one occasion, on Aug. 20, when the strap of the engine broke three times. He had recently seen the Jump reservoir overflowing 2 to 4 inches.

Cross-examined: He did not see the outlet valves touched, except when the engine stopped.

Mr. *Horace Keywood*, Surveyor of the Hoyland Nether district, said he accompanied Mr. Johnson to the pressure valve on Oct. 2. The lever was jammed; and it was released, and made to work properly. He came to the conclusion that the jamming had been caused by the outlet valve being closed suddenly. On Dec. 26, he went again, and found the same state of things as before; and the same thing was done. On March 28 he went again, with the same result. On this occasion the lever was pressed down to its full extent, and wedged by Mr. Johnson so that it could not jam.

Tuesday, June 4.

In cross-examination this morning, Mr. Keywood said that in Hoyland the supply was provided by the Company, not by the Council; and complaints would naturally be made to the Company. But he had known of one or two cases in which individuals had complained, and on investigation found that the cause was insufficiency of the service-pipes. There had been no complaints by the Local Authority against the Company during his term of office; but he had heard of such a complaint previously, and a reference to the Local Government Board. He understood that the result was that the supply was put under pressure; and since then there had been no complaint. On the occasion of a surprise call to the fire brigade about a year ago it was found that the water would not reach beyond the level of the stand-pipe; and he so reported to his Council. Witness was then cross-examined as to the state of the pressure valve when he visited it in company with the previous witness, and said it was just possible, but not likely, that the brick on the lever might have fallen upon it accidentally. He attributed the jamming of the valve to a sudden stoppage of the water at the meter. A gradual reduction in the quantity of water passing the pressure valve might be produced by the action of the weather on the lever of the valve. Before his visits he had no idea that the valve was jammed. He simply accompanied Mr. Johnson on the latter occasion for the purpose of giving evidence if necessary. He formed no opinion as to why the valve was jammed.

Re-examined: As far as he could judge, the pressure valve was an efficient instrument. He knew of none better. He believed the Provisional Order requiring constant pressure was made after the Local Government Board inquiry, in consequence of the complaints from Hoyland.

Walter Gray, a watchman in defendants' employment, produced his note books recording his observations. On several occasions he had noticed the small tank at plaintiffs' pump overflowing, and the engine was stopped. Sometimes only one valve was open, and one shut.

Cross-examined: He had seen the tank running over without the engine being stopped. The pump was air-bound. He had seen the engine running, and the pump not working. When this happened, it was attended to by plaintiffs' workmen. He believed he had seen the valves slackened off, but had not noted it.

Herbert Johnson, a lad employed by the defendants since December last to watch the plaintiffs' operations, gave similar evidence as to the tank overflowing occasionally, and to the turning on and off of the valves by the plaintiffs' workmen. He had never known the valves to be partially turned on.

Cross-examined: He was only on duty in the day time. He never saw the Roebuck tank empty, nor partially so. He could not see into the tank except through a hole; and if plaintiffs' men caught him, they threw him away.

Re-examined: Plaintiffs' men tried to prevent him making observations, both at the pumping tank and at Roebuck and Jump.

Geo. Crabtree was then called to verify the entries made by him, at his father's dictation, in the note books. He was cross-examined at some length on the entries. It appeared that some of those in red ink were made by Mr. Johnson; others he could not recognize the handwriting of; but a few were in his own writing, made at home at his father's request. He noticed a greater flow of water after the pressure valve was altered. He was employed watching from May 19 to 26, in the daytime only; no one else being on duty with him.

This concluded the evidence for the defendants.

Mr. GLEN then summed up the case on their behalf. He submitted that the Company, being a statutory body, their first duty was to their own ratepayers, and they could not be called upon to furnish the plaintiffs with such a quantity of water as would interfere with those obligations, and, further, that the demand for 210,000 gallons per day would so interfere, and could not therefore be insisted upon. He went on to read the various sections in the Acts bearing on the question.

Wednesday, June 5.

Mr. GLEN continued his speech this morning, dealing in some detail with the evidence.

Mr. MACMORRAN having replied on the whole case,

His LORDSHIP said he would give judgment the following Saturday.

Saturday, June 8.

JUDGMENT.

Justice SWINFEN EADY, in giving judgment, said the complaint of the plaintiffs was that the defendant Company were bound to supply them with water at such a pressure as would reach the top storey of the highest house in their district, which they had refused to do; and, secondly, that they had failed to deliver such quantity of water as the plaintiffs were entitled to require under the arrangements between them. In dealing with the first question, he went carefully through the history of the arrangements made between plaintiffs' predecessors—the Local Board—and the promoters of the Company, the various agreements which were entered into, the clauses in the Company's Act of 1880, the Provisional Order in 1901, and the section in the Water-Works Clauses Act, 1847, which were concerned, and came to the conclusion that the Water Company were not under any obligation to deliver to the plaintiffs water in bulk under pressure at the point of delivery. So long as they delivered at the point agreed upon the water reasonably required by the plaintiffs for the supply of their district, their obligation was discharged. Then came the question whether the plaintiffs had had sufficient water delivered to them at this point, and the further question as to what quantity they were entitled to demand. The plaintiffs sent a requisition for 210,000 gallons, which the defendants said was unreasonable, and also alleged that the plaintiffs were taking the water so irregularly that it disorganized their system and interfered with the performance of their statutory obligations. After reading from correspondence which led up to the introduction of the

pressure-reducing gauge on Aug. 1, his Lordship said it was obvious that a great part of the difficulty in the distribution of the water had arisen by reason of the arrangements made by the plaintiffs for its reception and distribution, which were quite inadequate. It would not be right to criticize them too severely, because the arrangement was only a temporary one pending the decision of the question of the liability of the defendants to deliver under pressure, because if that were determined in plaintiffs' favour, elaborate works for the reception and distribution of the water would be unnecessary; and he believed that the plaintiffs had done their best to provide a temporary expedient. The point of delivery was the agreed point at Jump Four Lane Ends, 418 feet above Ordnance datum; andif a connection were made between this point and the Jump reservoir, the water would flow into it by gravitation, and the reservoir, if kept full, would have supplied the highest part of the district with the exception of the schoolhouse, provided it was so distributed as to give an intermittent supply to various parts of the district. But the only arrangement for receiving the water at Four Lane Ends, and distributing it, consisted of a tank holding 788 gallons, with a centrifugal pump worked by a gas-engine. The consequence had been that if at any time the engine or pump failed to work, or became air-bound, the water had to be turned off from the tank, which, in a few minutes, became empty. This sort of breakdown had constantly occurred. Records had been kept of the stoppages; but he was not satisfied that the plaintiff Council had been always correctly informed of the number or duration of the stoppages. The records kept by the plaintiffs' and the defendants' men respectively, who seemed to have kept a vigilant watch over one another, did not tally; and as there had been great friction between the two parties, he was not sure that the plaintiffs' record showed all the stoppages. If an arrangement had been made by which the water delivered through the meters could have been pumped into the Roebuck tank when the engine was working, and at other times could flow by gravitation into the Jump reservoir, the valves need never have been closed and the supply obstructed. The friction between the parties seemed also to have led to the Jump reservoir being emptied and kept empty for a long period; and he could not accept the explanation given of that as being well founded. If the object had been to show that the district could not be properly supplied from that reservoir, the proper course would have been to fill it, and then see whether the water reached the various houses. It was quite clear that many parts of the district were short of water; some houses being without any for more than twenty-four hours. The only dispute was who was to blame. The plaintiffs alleged that they could not obtain the water they wanted; while the defendants said it was there, but the plaintiffs would not, or did not, take it. It was quite clear that the defendants always kept the main fully charged with water, and at sufficient pressure to supply Four Lane Ends, as was shown by the recording pressure-gauge which was put in for a time at the keeper's cottage, which never showed less than a head of 150 feet, which, allowing for the difference of level, equalled 127 feet at the meters. The question was why, under such circumstances, the plaintiffs did not receive more water; and though he put the question to the engineers on each side, none of them had been able to explain the remarkable variations which had occurred, unless the valves had been tampered with. The witnesses on each side denied that this had been done by them, though each suggested it had been done by the other side. Up to Aug. 1, the plaintiffs had been in the habit of taking the water at irregular intervals, turning it on as they pleased, and thus putting a sudden pressure on the main, which tended to disorganize the defendants' distribution; and, in his opinion, they were not justified in so doing. They had contracted for a supply in bulk, which ought to be supplied regularly and continuously, and proper arrangements should have been made for storing and distributing it. The storage capacity, equal to about 3¼ million gallons, seemed to be ample to ensure regularity of supply, if the means of distribution had been efficient. With regard to the great variation in the quantities received, he had come to the conclusion that it was contributed to by several causes. In the first place, it was evident that the meters did not always register correctly. They had been several times changed; and, on testing, the old ones had been found defective. On one or two occasions the 3-inch meter registered much less than the 2-inch; so that the low reading could not be due to any change in the pressure. It was quite possible that some of the variations were more apparent than real, as the meter readings could not be altogether relied upon. Another thing which had probably contributed was the valves not being opened wide enough, because on the occasion when experiments were made by opening the valves, a much larger quantity of water passed—more, in fact, than the pump could deal with; and he believed that it was the restricted orifice through which the water had to pass which contributed to the shortness of the supply. The defendants did not seriously dispute this; but they met it by saying that the valve had continually got jammed by the plaintiffs suddenly turning off the outlet valve, which produced a concussion, or shock, and jammed the reducing valve. It was proved also that on several occasions when the valve had been released, the supply improved. The result on this part of the case was that the plaintiffs had not received as much water as they were entitled to; but it had been in a large measure their own fault. Then came the question as to what quantity the plaintiffs were reasonably entitled to require; and after reviewing the very conflicting evidence which had been given on this point, and referring to the quantity supplied before any differences arose, he came to the conclusion that the plaintiffs might reasonably require at the present time 180,000 gallons per day, or at the rate of 12 gallons per head per day, on an estimated population of 15,000, and that their duty was to receive this quantity continuously and not intermittently. There was a claim for damages; but this was based entirely on the claim to a constant supply under pressure, and fell with it. With regard to costs, as he thought that if the defendants had attended to their valves more regularly, and seen that they were sufficiently open, more water would have reached the plaintiffs, it would be fair to order the plaintiffs to pay one-half the taxed costs of the defendants.

We learn that the Imperial Stove Company, of Leamington, have just secured an order from the South Metropolitan Gas Company for 1000 of their large packed cookers.

SUTTON GAS COMPANY'S MAIN-LAYING OPERATIONS.

At the Epsom Petty Sessions, on Monday last week, application was made by the Sutton Gas Company for permission to lay mains with 2-feet coverings; thereby setting aside the regulations of the Epsom Rural District Council, which stipulated that all mains should be laid with 3-feet coverings.

Mr. W. MACKENZIE appeared for the appellants; and Mr. ALEX. GLEN, K.C., represented the District Council.

Mr. MACKENZIE said he made an application on behalf of the Sutton Gas Company. What the Bench had to decide was whether the Company should in a particular case lay pipes with more than 2 feet of covering. His friend would say this was not enough. The Company were about to lay some mains in two roads in one of their sub-districts, which was also in the area of the Epsom Rural District Council. The Council had power of control over the roads; and under the statute the Company had to give notice and present plans of the work when they wanted to break up any road. Under the Gas-Works Clauses Act, 1847, section 9, the Company had the right to break up streets, as circumstances required, on giving notice to the persons having control. This was the section under which they appeared before the Court. It went on to state that the plans of the work should be approved by the persons having control, or, in a difference respecting such plans, then according to such plans as shall be approved by two Justices. The two roads were Cheam Common Road and Longfellow Road, Worcester Park, running almost at right angles. In the Cheam Common Road, the Company proposed to lay a 6-inch main; and a 4-inch main in Longfellow Road. Notice of their intention to open the roads, and plans of the works, were sent to the Surveyor by their Works Manager, Mr. Stephen Carpenter; and on Feb. 21 the Surveyor wrote saying the plans could not be approved, as it was proposed to lay the mains 2 feet below the road instead of 3 feet, as required by the Council. Replying to one of the Magistrates, Counsel said that the Company had to make the roads up and keep them in repair for three months. In the present case, the requirements of the Council meant a difference of £75 in the initial cost of laying the main. There would be additional cost every time they wanted to connect a service-pipe. His clients did not only look at the question from this point, but also from the point of view of the public. The deeper the mains were laid, the longer it took the roads to consolidate; while the additional expense would also mean that the public would not get the gas so cheaply. In January, 1903, the Epsom Rural District Council affixed their seal to what were called regulations to be observed by persons breaking up the roads in their district. The regulations required that all mains should be laid 3 feet from the surface. The regulations were communicated to Mr. Carpenter, who for a time observed them; but a little while after he discovered that the Council had no power to make regulations of this sort. There was the question of traffic going over the mains; and it was for the Justices to determine whether the 2-feet covering was a safe one or not. He asked them to remember that the Company were materially interested in any escape of gas which would arise from the breakage of pipes; and it was natural that they would only want to lay pipes where they were not likely to get broken, or it would be very false economy. He would be supported by experts in saying that a covering of 2 feet, when pipes were laid in virgin soil, was safe and perfectly reasonable in roads of this sort.

Mr. *Stephen Carpenter*, the Works Manager to the Company, said it was his duty to see to the opening and making-up of the roads. In the Sutton district the maximum depth over the pipes was 2 feet; and the Sutton Local Authority had never asked for more. He had not known one pipe to become fractured during the past 32 years. In the Epsom Rural District there were coverings of 2 feet and under; and no trouble had been experienced with them. In 1901, he had a notice from Mr. Weare saying that the Council required all pipes put in 3-feet trenches. In some cases this notice was complied with; and it was in consequence of this notice that a previous main was laid with that cover. At Benhilton, Sutton, where the tramways pass over, there was a covering of 1 ft. 9 in.; and the pipes were 3-inch. Steam-rollers weighing 12½ tons passed over the pipes. From his experience in the district, 2-feet covering was enough where the mains were laid in virgin soil. The roads in question were of clay; and when the Company remade the roads, they put in a foundation of chalk to the extent of 6 inches.

By the BENCH: As an expert, he considered a pipe 2 feet down as safe as one 3 feet down.

In cross-examination, witness said he was Chairman of the Sutton Urban District Council. The pipe running up to Banstead Downs was only 1 ft. 9 in. under the ground, and was laid 3 feet from the kerb. No part was laid under the pavement. He did not know when a pipe was laid a certain depth that it would have to remain there for all time. There had not, to his memory, been any leakages during the past two or three years. Since the advent of heavy traffic there had been no more leakages than formerly. He did not know that within recent years Croydon and Dorking required and had 3-feet coverings. If there were 43 openings in one month to repair pipes, there would be something wrong somewhere. Possibly it would be owing to the trenches being badly filled in. It depended upon the depth as to whether the service-pipe joined the main at the top or the side.

Mr. *G. Mead-Robins*, the Secretary and Engineer to the Company, said he remembered in 1905 that Mr. Carpenter was laying a main with a 3-feet covering, and that he stopped him, as he thought 2 feet was deep enough. He estimated that the extra cost of laying this particular main, if it had a 3-feet covering, would be £75. It would not be sufficient to say that the extra cost would only be 3d. or 4d. per yard. The cost was only reduced on getting through the top crust. A covering of 2 feet was quite sufficient to answer all purposes.

Mr. *Charles Carpenter*, the Chief Engineer to the South Metropolitan Gas Company, said he had charge of a district, 52 square miles, which was covered by 14 local authorities. Each local authority had its engineer to see that the roads were properly made-up; and not one of these had ever raised the question of 2-feet covering being insufficient. He never had mains laid with more than 2-feet covering. Sometimes

he had to go lower; but that was only in order to get under another main which was already there. There were only 2-feet coverings in the Old Kent Road; and 2-feet coverings in the Cheam Common Road would be perfectly safe. His experience had been one of considerable variety, embracing country districts and districts thickly populated. If the Sutton Gas Company only had 6 per cent. of unaccounted-for gas, it showed that their system could not be in a very bad condition. This would be the best testimonial they could have.

By Mr. GLEN: If the requirements of the district did not necessitate relaying, the mains would last for 70 or 80 years. There was no parallel between the Old Kent Road and the Cheam Common Road. Some roads took longer to consolidate than others, though he could not conceive moisture getting through and doing any damage. The joints would yield when heavy traffic passed over them, as they were flexible; but there would be a considerable amount of "give" before leakage. Leakages were more likely to take place in clay than in gravel soil. In a street like Longfellow Road, 2-feet covering would suffice.

Re-examined: He laid 32 miles of mains last year with a maximum covering of 2 feet.

Mr. *Charles Hunt* said when at Birmingham he had charge of the distribution of gas, and of the repair of the roads. He had charge of 600 or 700 miles; and he always adopted 2-feet depth. Before the introduction of the steam-roller, some of the mains were laid at 9 inches and 1 foot. He agreed with the previous witnesses that 2-feet covering was sufficient. In his experience he had never known a steam-roller to injure a main except once, and that was when the pipe was crossed by an unconsolidated sewer trench. He was a Director of the South Suburban Gas Company; and their rule was to have 2-feet covering.

Mr. *T. E. Weare*, the Surveyor to the Epsom Rural District Council, said he had reason to complain of the frequent opening of mains, and it was thought they were not laid low enough. This was in 1901; and the Council decided that the mains should be laid in 3-feet trenches. In 1904, when it was decided by the Council that there should be 3-feet cover, the appellant Company laid a considerable length of sewer in Banstead. He believed that the Company had from 1901 to 1906 laid mains at about that depth. The Council had disapproved of the plans for laying mains in the roads in question on account of the Company suggesting 2-feet cover. Both roads were of similar construction; and where roads were of clay subsoils, there was less resistance to pressure. In October, 1905, there were no less than 43 openings of roads in the district owing to fractures of gas and water mains, though there were no fractures in the Sutton Company's mains. He did not recollect any 3-feet mains being opened. If the mains were properly joined, and there were leakages, he could only put it down to traffic. He had received notices to examine six mains in two years. From 1900 to 1905, all the Sutton mains were laid in 3-feet trenches, or with 3-feet covers. A case occurred at Cobham where the gas was found in the sewer; and in that case the main was laid at a depth of 2 ft. 3 in. These cases had been so frequent that the Epsom and Ewell Companies had relaid their mains at 3-feet depth. In Worcester Park some trees had died because the soil was so saturated with gas; and a lady in Epsom had had blood poisoning owing to the escape of gas. Having regard to all the facts, the District Council did not consider 2-feet covering sufficient; and he advised the Council not to sanction less than 3-feet covering.

By Mr. MACKENZIE: He was not a gas engineer, and did not know exactly what the reasons were which caused a gas-main to leak. Not one of the openings referred to were in connection with the Sutton Gas Company. He could not rebut the statement that 50 per cent. of the Company's mains were laid with 2-feet covering; nor had he any evidence of the mains belonging to the Company being broken.

Re-examined: An electric cable 2 feet below the surface had been broken by the Council's steam-roller.

The hearing of the case was then adjourned.

Suicide by Gas at Halifax.—The Coroner's Jury appointed to inquire into the death of a Halifax man named Gilligar returned a verdict of "Suicide while suffering from depression." Deceased had been short of work, and was suffering from nervous debility. He was found dead on his bed with one end of an india-rubber tube over the gas-jet, and the other near his mouth. The room was full of gas.

Gas or Electricity for Westbourne Terrace.—At the last meeting of the Paddington Borough Council, the lighting of Westbourne Terrace was considered. Previously arc lamps had been used; and at the last meeting of the Council it was proposed that these should be removed, and gas substituted. An amendment was carried to the effect that the Metropolitan Electric Supply Company be asked the terms on which they would continue to supply current. Last Tuesday, it was reported that the Company had offered to fix and maintain flame-arc lamps to the twelve existing posts, and supply same with current, for the sum of £19 each per annum, on a ten years' agreement. The Council considered these terms unsatisfactory; and resolved that no further action be taken at present with a view to lighting the terrace with electricity. They, however, adjourned for two months the consideration of the question relating to the removal of the columns.

Gas and Water Profits at Carlisle.—The Carlisle gas and water accounts for the year to March 31 are very satisfactory. The gross profits on the gas undertaking amount to £12,606; and after deducting the repayment of loans and interest, income-tax, and other charges, the net profit is £6868, as compared with £7049 for the preceding twelve months. The water accounts (which include fixed charges for water-rental for nine months only) show a gross profit of £8338, and a net profit of £6693, after making deductions for the repayment of loans and interest thereon, income-tax, &c. The net profit for the previous full year amounted to £7556. Owing to the recommendation of the Auditor, the practice of taking the portion of the income represented by fixed charges for water-rental to the end of June, which has been followed hitherto, has this year been abandoned; and the accounts have been made up to March 31 instead. Thus, while there is a seeming decrease in the total profits, there is really a very substantial increase. Had the accounts been prepared in the same way as hitherto, the income would have been £14,615, or nearly £1800 in excess of that of the previous year.

MISCELLANEOUS NEWS.

INCREASES IN THE PRICE OF GAS IN LONDON.

Owing to the large increase in the price of coal, the South Metropolitan Gas Company have had to give notice of an advance in the price of gas of 3d. per 1000 cubic feet (making the charge 2s. 3d.), and the Commercial Gas Company of 1d. (making the ordinary charge 2s. 6d.).

As Chairman of the Board of the South Metropolitan Company, Sir George Livesey has addressed the following statement to the consumers, in which he sets forth the reasons compelling the increase:—

"The Directors, with much regret, give notice that the price of gas will be increased to 2s. 3d. per 1000 cubic feet from Midsummer, 1907. This is necessitated by the great increase in the cost of coal and in the rates. (The slot-meter consumers will have a smaller amount returned when the box is cleared.)

"The price of gas coal, free on board in the Tyne, has advanced more than 50 per cent., or, to be exact, 53 per cent., to this Company in the last two years, due partly to the great activity in the iron trade, but more to the large increase in the foreign demand. The duty on coal exported, which the foreigner paid, was repealed last October, and was at once followed by a large additional demand. Up to that time, the price of coal had only advanced 1s. per ton. The great rise then took place, with the result that the Company's coal bill for the year exceeds by quite £240,000 that of two years ago.

"The Company pay in rates about 50 per cent. more than seven years ago, the sum now amounting to about £88,000 a year. The poundage is not only considerably higher, but the assessments in the south-eastern parishes in the Company's district have been largely, and, as the Directors think, unfairly increased. In those parishes the charge for rates is about ½d. per 1000 feet more than in the other and much larger portion of the district. Had the difference amounted to 1d. per 1000 feet—and there is more than a hint of a further increase in the future—the Company would have corrected the inequality by charging an extra penny for the gas supplied in the heavily assessed parishes, as the only means of dealing justly towards those where the assessments have been fixed in a reasonable spirit. The amount paid in rates is 7 per cent. of the price of gas, or about 1¾d. per 1000 feet, which greatly exceeds the proportion paid on all other articles.

"It has been said by coal owners and miners, and the south-eastern rating authorities above referred to, that gas companies pay large dividends, and that they can raise the price of gas. The first part of the statement is fallacious; and as to the latter, the Directors have to say that raising the price of gas does not give them any of the satisfaction that coal owners and miners evidently obtain by increasing the price of coal. It is true that in years long past Parliament authorized 10 and 7 per cent. dividends for gas companies, but the last of those Acts for 10 per cent. capital was passed in 1869, and the last for 7 per cent. in 1875. The participators in those issues have nearly all passed away. The sliding-scale to regulate the dividends by the price of gas—allowing a slight increase of dividend for every penny reduction, with a similar reduction of dividend for every penny increase in the price of gas—thus making shareholders and consumers partners, was then introduced. At the same time, in 1876, Parliament adopted a Standing Order requiring all new gas capital to be issued (not to the shareholders) but to the general public under what are known as the auction clauses, at the current market price. For instance, this Company issued, in January last, £100,000 of new capital at the market price of £128 for £100 of stock. The whole £128,000 is used in the business, but only the £100,000 bears interest (5½ per cent. at present), the premium of £28,000, or whatever it may be—for it varies from time to time—bears none. The interest, therefore, which purchasers of stock get upon their investment is not 5½ per cent., but only about £4 6s. per cent.; and this rises or falls according to the price of gas. The sliding-scale and auction clauses have been in operation for more than 30 years; and notwithstanding this fact, there remains a common and utterly erroneous belief that gas shareholders are in receipt of very high dividends, whereas all they get is the current market rate of about 4½ per cent. or less.

"It has been the policy of this Company for a generation and more to reduce the price of gas whenever possible. The last reduction was made three years ago, to 2s. per 1000 feet, at which price the shareholders are entitled to a quarter per cent. of dividend, or about £15,000 a year more than they have received. After the last reduction, the price of coke and other residual products fell, and the extra dividend was not earned, and, therefore, was not paid. The consumers of gas got the full benefit of the reduction, but the shareholders have not had their corresponding increased dividend. Consequently the increase of price will cause a smaller reduction of the actual dividend paid than would have been the case if they had been receiving the full dividend to which they were entitled under the sliding-scale.

"For the information of some 5000 consumers who are shareholders, and have invested about one-and-a-half millions in the Company in the last seventeen years, the nominal dividend of 5½ per cent. hitherto paid will be paid in August next; but for the following half year it will be reduced, in February, 1908, to £5 6s. 8d. per cent., thus reducing the interest on their investments from about £4 6s. to, say, £4 3s. 6d. per cent. The dividend payable at the increased price will be £26,400 less than that to which the shareholders were entitled at the old price; but their actual loss of dividend will be £11,400 in the year—the difference of £15,000 being explained above.

"The employees of the Company will also suffer from the increase in the price of gas. Under the co-partnership arrangement, which is simply an extension of the sliding-scale to the employees, they are included in a partnership of prosperity or adversity with the consumers and shareholders. By the increase in price, not only will the dividend of the shareholders be reduced, but the employees will receive at least £10,000 less bonus for the ensuing year.

"The Directors can assure consumers, shareholders, and employees, that the price will be again reduced, and the dividend and bonus restored, as soon as possible."

DEVONPORT CORPORATION GAS-WORKS.

The Past Year's Working—Engineer's Salary Increased.

The annual report of the Gas Engineer (Mr. Joseph W. Buckley, Assoc.M.Inst.C.E.) was presented to the Devonport Town Council last Thursday, together with a recommendation by the Gas Committee that the salary of Mr. Buckley should be advanced by £50 per annum, in two instalments of £25 each. A summary of Mr. Buckley's report was published in the "JOURNAL" on June 4, p. 677.

Alderman W. HORNBROOK, the Chairman of the Gas Committee, in moving the confirmation of the minutes, congratulated the Committee, the Council, and the town on the results achieved during the past year. It was not necessary to dwell at any length upon the figures, for the report of the Engineer presented them in so clear a form that "he who runs may read." The central fact was that they had a gross profit on last year's trading of £19,019. Out of this, they had to pay £8927 for interest on loans, and then £8200 had to be set aside towards the repayment of the debt on the undertaking. This left a balance of £2188, which the Committee proposed to place to the reserve fund. He hoped the Committee would not be asked to reduce the price of gas or to make any contribution to the rates this year. They would do it as soon as possible. The amount now to be added would bring the total of the reserve fund to £5000. When they had accumulated £5000 more, he thought they would be in a position to do something either for the relief of the rates or a reduction in the price of gas; but it was necessary first to provide a sufficient sum to insure against accidents and contingencies. This year they had to face the fact that the price of coal was greatly advanced. The consequence of this would be an increase in the expenditure of more than £4000 over last year. Another fact to be borne in mind was that they had lost a customer for 8 million cubic feet of gas. They had gained through the slot installations other customers who had made up this loss and rather more. It was known that there would be a further reduction in the consumption in the Government establishments; but they hoped that the slot consumers would again come to their assistance. With reference to the proposal to increase the salary of the Engineer, he said the success which had been achieved in the conduct of the works was obvious. The Engineer's report showed that during the past year £556 had been saved by the disuse of the system of bagging the coal discharged from ships, £731 by the reduction of the cost of carbonizing, and £690 realized by an increased production of sulphate of ammonia. This was a very fine achievement for one year. When Mr. Buckley was engaged, the Committee did not give him as large a salary as his predecessor—their intention being to increase it if he gave satisfaction; and they now asked the Council to give effect to that intention.

Mr. JARVIS seconded the motion.

Mr. RENDLE remarked that, although Alderman Hornbrook had spoken in glowing terms of the success of the gas-works last year, to him the result was somewhat disappointing. They had a capital of £300,000 invested in the undertaking. Six years ago, when the Corporation took them over, the gas-works were paying well, and the shareholders were receiving the full dividends. Having taken over such a prosperous business and developed it, they naturally looked for something handsome in return. Had they got it? Last year about £800 was carried to the reserve fund; and this year the sum of £2188 was to be disposed of in the same way. It was said in the report that £1900 had been saved through the careful control of the Engineer; so that, apart from this saving, they had only £200 to the good.

Mr. PALMER argued that the time was not opportune for increasing salaries. He said that the late Manager received £400 a year, with house, coal, gas, and water free. The present Manager was appointed at £450 without these privileges. He considered £450 a year a good salary; and though economy had been effected at the gas-works, he did not like the idea that men should have been discharged and that they should now add to the remuneration of the chief official of the department. He moved that the minute as to the increase of salary be not confirmed.

Mr. MONK seconded the amendment. He said that he believed they had a most competent Gas Engineer; but the Gas Committee had other things to consider than the raising of salaries. They ought first to make some concession to the poorer consumers—the users of slot meters, who had proved the saviours of the gas undertaking.

Mr. BRENTON argued that the Committee ought to have refused to consider the salaries question until gas was reduced in price.

Mr. FREDMAN said that he was opposed to the payment of £450 a year to the Gas Engineer when he was appointed, for he could not see why he should be better paid than the Borough Surveyor, the Water Engineer, or the Electrical Engineer.

Mr. PAUL pointed to the better appearance of the gas-works, and to the great improvements effected out of revenue, as evidence of the Engineer's capacity. The work of remodelling the gas-works was only just commencing. Though they had spent £43,000, they had not done anything which would produce a foot more gas, or produce it more cheaply. This work lay before them; and it was in the interest of the town that it should be carried out under the supervision of a man who had a grasp of things.

Mr. BARTLETT, as an economist, supported the increase, and was convinced that if the working men ratepayers of the town were acquainted with the transformation carried out at the gas-works, they would approve it too. As to the discharge of men, this was due to the water-gas plant, and to the employment of the stoking machinery which had previously been out of use.

Alderman HORNBROOK said he was content to leave the decision to the good sense of the Council.

On a vote being taking, the amendment for the rejection of the proposed increase was lost by 23 votes to 21; and the minutes of the Gas Committee were then adopted.

Sale of Shares.—At Kingston, Messrs. Nightingale, Phillips, and Page lately disposed of £200 of ordinary stock in the Hampton Court Gas Company for £234 10s.; while some perpetual debentures in the Company realized an average price of £104 for £100 of stock.

RECORD YEAR AT BURSLEM.

Wolstanton Gas Scheme.

The minutes of the Gas Committee which were submitted at the last monthly meeting of the Town Council stated that the Chairman (Mr. S. Johnson), the Vice-Chairman, and the Town Clerk had met a deputation from the Wolstanton Urban District Council, who asked for certain particulars to enable them to make an offer for the mains, pipes, and other works in Wolstanton; and the Town Clerk was instructed to supply particulars of lengths of mains and numbers of services, meters, and stoves. The Town Clerk reported that he had acted on these instructions, and that he had since been served with notice of the appointment of Mr. Corbet Woodall as Arbitrator on behalf of the Wolstanton Council, to settle the amount of compensation payable to the Corporation for mains, pipes, and other works in the district of the Council. The Committee recommended that Mr. W. A. Valon be appointed to act as Arbitrator on behalf of the Corporation, and that the Town Clerk be instructed to give notice to the Wolstanton Council to terminate the contract for street lighting on Dec. 20 next. Also that the Town Clerk be instructed to give notice to the Hanley Corporation that the charge for gas supplied by the Burslem Corporation to lamps within the Hanley boundary will be increased to £3 per lamp per annum as from June 24. The Committee resolved that the report of the Auditor (Mr. Bladen) on the accounts of the gas-works for the year to March 31 be received, and that the sum of £2000 be placed in a deposit account as a reserve fund to meet anticipated expenditure on new retorts. The Manager (Mr. Edward Jones) was instructed to fit with incandescent burners all public lamps in the borough which now have flat-flame burners. An application by the Manager for an increase of salary was considered; and it was recommended that his salary be fixed at a maximum of £400 per annum, that he have an advance of £50 for the year commencing June 1, 1907, and two advances of £25 each on June 1, 1908, and 1909. Other increases to the staff were also recommended.

In moving the adoption of the minutes, Mr. Johnson remarked that every member of the Council had received a copy of the statement of accounts prepared by the Auditor; and from this they would see that the past year had been one of the best that the gas undertaking had experienced since it was acquired by the Corporation—in fact, he believed it had been a record year in every respect. The gross profits amounted to £11,832, against £10,511 for the previous twelve months—a very substantial increase, especially when they took into consideration the £929 extraordinary expenditure in connection with the opposition to the Wolstanton Gas Bill, which had been paid during the year. Had it not been for this expenditure, they would have had an increased gross profit of £2250. As it was, the increase amounted to £1321. Some people might feel inclined to criticize their action in opposing the Wolstanton gas scheme; but so far as he was concerned—and he thought he could speak for his Committee—he was quite prepared to take his full share of the responsibility, as he believed if they had not opposed the Bill they would have laid themselves open to the charge of neglecting the interests of the Burslem ratepayers. To his mind, it was a great injustice that one authority should be allowed to step in and take from a neighbour a portion of their business, as Wolstanton was being allowed to do, without paying compensation. There was no doubt that Burslem bought the right to supply Wolstanton with gas; and if Wolstanton wanted to make their own gas, surely in common fairness they should have given Burslem some compensation. He thought it would have paid Wolstanton much better to have come to them in a reasonable spirit, and have offered them some compensation, rather than squander both their own money and that of Burslem in useless law costs. However, the Wolstanton Authority thought they would be smart. Hence they had themselves spent £2800 on the Bill, Burslem had spent altogether £1014; and he supposed Newcastle's expenditure would be about equal to their own. Altogether, therefore, the Bill had so far cost about £5000 of the ratepayers' money, which might have been saved had the Wolstanton people been reasonable. The net profit, after paying interest on loans and sinking fund, was £5330, against £2251, or an increase of £3079; so that, after paying £1200 in respect of last year's contribution to the relief of the rates, they had a balance of £4130. This the Committee proposed to deal with as follows: £1500 to the relief of rates, as promised, for the ensuing year; £2000 to be placed in deposit account as a reserve for retort-house renewals which would be required during the next eighteen months or two years; and £400 to £500 to be expended on improvements to street lighting. At present they had 539 lamps still fitted with flat-flame burners, which were altogether out of date; and they proposed to convert all these to the incandescent system. The rates would therefore benefit altogether this year by £2000 from the profits of the undertaking. For the first time since he had had the honour to make this annual statement, he was pleased to say they had a balance in the hands of the Treasurer of £6559; so that they were no longer working the concern altogether on credit. He hoped the Council would in the future always set their face against starving the undertaking by drawing money from it for the relief of the rates, unless they were fully satisfied that the concern was in a position to grant such relief. To fully realize the progress the gas undertaking had been making during the last few years, he should like to draw their attention to its financial position three years back. On March 31, 1904, there was a debit balance at the bank of £7108. In addition to this, there were temporary loans, amounting to £3600, which he supposed had been borrowed to reduce the bank overdraft, making a total adverse balance of £10,708; and he believed though in 1904 there was this adverse balance, there was £700 granted to relieve the rates. Since that date, they had cleared off both the debit balance at the bank and the temporary loans. Now the undertaking was in a thoroughly sound position from a financial point of view; and at the same time they had fully maintained the general efficiency of the works, which he believed were never better equipped. Turning to the Manager's report for the year, the total output of gas was 225,317,000 cubic feet, against 230,186,000 feet, or a decrease of about 2 per cent. The coal used was 19,720 tons, against 20,315 tons last year, a decrease of 595 tons, or a little over 2 per cent. The gas made per ton of coal was again very satisfactory, being 11,413 cubic feet, as against 11,317 feet. This

was a make which only very few undertakings could boast of, especially those who were manufacturing only coal gas. Going back three years, he found their make then was only 10,163 cubic feet per ton of coal; so that they had been making good progress in this direction as in others. He was also pleased to notice a marked improvement in the loss through leakage, which this last year worked out at 8 per cent., against 11 per cent. the previous year. This loss was still very heavy; and he hoped that, by strict attention, they would be able to further reduce it. It was satisfactory to notice that, though they had a decrease in output of something like 5,000,000 cubic feet of gas, the residuals produced an increased income of £530, which was partly owing to improved markets, and also to a large extent to careful management. One item especially called for comment—sulphate of ammonia. Though they had used 595 tons of coal less, they had an increase in the sulphate produced of 13 tons, which went to prove that the plant had been well managed. The yield of sulphate had been 28·17 lbs. per ton of coal used, as against 24·6 lbs. in 1905. Coke had realized a better price generally; but as they had several old contracts on hand at a low figure, they had not up to the present felt the full benefit of the advance. This was the first complete year of the undertaking under the management of Mr. Jones; and as Chairman of the Committee, he must congratulate them on having in Mr. Jones a thoroughly competent and up-to-date manager. He was, indeed, fully satisfied that they had got the right man in the right place. Mr. Jones was full of energy, and was very enthusiastic; and he was not only a good engineer, but a good manager of those placed under his charge. The staff had been thoroughly reorganized, and everything seemed to be working smoothly; and he should like to take the opportunity of thanking Mr. Jones and his staff generally for the way they had pulled together during the past year. He hoped when they came to the recommendations of the Gas Committee with regard to the increases of salaries they would pass them ungrudgingly, as he believed the increases asked for had been well earned, and one and all well deserved. In conclusion, he replied to a statement made by the Chairman of the Wolstanton Urban District Council (Mr. C. H. Bowers), who had said that Wolstanton wanted to come to an arrangement with Burslem as to the transfer of mains, fittings, &c., without going to arbitration; but Burslem would not make an offer. Burslem had met Wolstanton; and the thing had been thoroughly threshed out. Wolstanton were asked what particulars they wanted; and the Town Clerk of Burslem had given them all the information they asked for. When the conference was over, Mr. Bowers eulogistically thanked them for the information given; and they separated on the understanding that Wolstanton would make them an offer. Wolstanton next asked for the appointment of an Arbitrator. Burslem had done everything they could to settle the matter without further costs; and had Wolstanton been anxious to settle, they could easily have done so. Wolstanton, had they so chosen, could even have made an offer based on the estimate of their own Advisory Engineer, Mr. Corbet Woodall. He threw the whole onus of further cost on the Wolstanton Council.

The minutes were adopted.

THE CHEAP GAS OF WIDNES.

A Satisfactory Report.

In moving the adoption of the Gas and Water Committee's minutes at the monthly meeting of the Widnes Town Council last week, Alderman Timmis, the Chairman, referred to the profit and loss account of the gas and water undertakings. He said the gas made during the past year showed an increase of 8·3 per cent., which was very satisfactory, and justified the expenditure incurred in connection with the new works and the new holder. The profit on the gas undertaking was £5255. This was an advance of £551 over the profit of the previous year—£4704—notwithstanding the fact that in September the price of gas was lowered 1d. per 1000 feet to the ordinary consumers and 2½d. to the slot-meter consumers. The cost of production amounted to 11·391d. per 1000 cubic feet, which, as they knew, was signally low. It was thought that the cost of production next year would be very much increased, because coal had risen. They anticipated an increase of £4000 in their coal bill for the year. The Committee trusted, however, that there would be no need to alter the price of gas, hoping that the increased volume of business would suffice to keep the charge where it was. Many authorities had already raised the price of gas. Water showed an increase of 8 per cent. in the amount pumped and in the quantity sold. This fact reflected the present prosperity of the town. The profit on the water undertaking was only £155; there having been unusual expenditure. The amount transferred from the gas-works account to the benefit of the public in the shape of free lighting of the town amounted to £1963, which was a very considerable sum to give away to the relief of the rates.

Mr. Lewis said the success of the gas undertaking seemed to increase year by year. When they would reach the culmination of that success, he did not know. The observations of the Chairman of the Committee might give them some pause in their expectation. They could congratulate themselves and the Gas Committee on the undertaking. The Mayor (Alderman S. Owens) also referred to the eminently satisfactory character of the report; and the minutes were then adopted.

A Suction Plant Explosion at Birmingham.—Some damage was caused early last week at the Birmingham Rim Works by an explosion in connection with a plant employed for making suction gas on the premises for power purposes. A portion of the glass roof of the one-storey building in which the plant is housed was blown out; and a number of window panes were smashed. A reverser named Frank Salmon, who was standing some yards away, was blown from his position, and thrown against some corrugated iron. He was temporarily stunned, but soon recovered, and was little the worse for the accident. Other workpeople who were standing quite near escaped injury. The accident occurred while applying a light for testing.

ANNUAL REPORT AT BURY.

The report of Mr. Henry Simmonds, the Engineer and Manager, on the past year's operations at the Bury Gas-Works, stated that the total quantity of gas made (including 68,850 cubic feet from benzol) was 417,215,850 cubic feet; while the leakage amounted to only 11,270,811 cubic feet, or 2·8 per cent. The cost of manufacture, distribution, &c., per 1000 cubic feet of gas sold was 2s. 1¼d., and the residuals realized 10½d.; so that the net cost was 1s. 2¾d. To this had to be added 7¾d. for interest and sinking fund, making the total cost per 1000 cubic feet sold 1s. 10¼d. The income from gas and hire of meters, cookers, and boilers was 2s. 2¾d. per 1000 feet, leaving a profit of £7517, or 4½d. per 1000 feet. One-half of this profit has been credited to the consumers, and the other half carried to the general rate. The Borough Auditors (Messrs. C. M. Merchant and Son), referring to the report, said: The price of gas during the past year has been 1s. 11d. per 1000 cubic feet to ordinary consumers, and 1s. 9d. for power purposes, as in the previous year. The revenue from this source for 1907 has been £43,067, compared with £40,722 for 1906. The outlay during the past year has amounted to £4099, including £571 expended on gas-stoves. The total sum spent on gas-stoves now amounts to £12,601. The increase during the past year in stove-hire is only £1 10s. 8d. It would appear that many stoves had become obsolete; but no depreciation is written off in respect of them.

These documents were included in the minutes of the Gas Committee submitted at the last meeting of the Town Council; and the Mayor (Alderman Fletcher), in moving their confirmation, pointed out that the Gas Committee estimated the profit for last year at £6000, and it had come out at £7517. This was surprising to the Committee, because they did not expect such a large consumption of gas as there had been. With regard to the future, they had decided that the net price of gas should be the same as last year. It was expected that the cost of coal this year would be higher; and under these circumstances they could not recommend a reduction in the price charged for gas. Mr. Smith drew attention to the reference in the Borough Auditors' report as to no depreciation being allowed for obsolete gas-stoves; and the Mayor explained the method of depreciation, and stated that the depreciation of the cookers was included in a general depreciation of the property of the Committee. As a fact, they were depreciating them rapidly.

The minutes were confirmed.

SOUTHPORT GAS ACCOUNTS.

The report of Mr. John Bond, the Gas Engineer to the Southport Corporation, which was noticed in last week's "JOURNAL" (p. 753), was referred to by the Deputy-Mayor (Alderman Travis) when moving the adoption of the Gas Committee's minutes at last Tuesday's meeting of the Town Council. He said that it was very satisfactory to find the consumption of gas was still growing, and pointed out that for the first time they had a make of over 500 million cubic feet per annum.

Continuing to deal with the minutes of the Gas Committee, Alderman Travis remarked that there was a reference in them to the inquiry held before the Board of Trade with regard to adopting the No. 2 "Metropolitan" argand burner for gas-testing purposes. This burner would enable them to supply gas which would comply with the Board of Trade standard, as now approved, which might be about 1½-candle power lower as tested by the same burner; and they were advised that the saving in cost of manufacture was about equal to ½d. per candle. But there would be a saving of ¾d. per candle if they dropped the quality by 1½ candles. To put it in cash, this would be £1500 on a year's supply of gas. It was pleasing to know that their financial position was a very good one. They had made a profit of £13,000, which went in aid of the rates; £1000 more had been paid to the reconstruction account than was paid last year; and £100 or so had been applied in writing off the cost of outside lamps which they had placed in certain instances before various shops by agreement with the occupiers of the shops on a five years' payment system. Instead of waiting five years, the Committee were paying for some of them out of revenue immediately. The total capital expenditure per 1000 cubic feet of gas sold was now 11s. 10d., as against 12s. in 1906; and the capital outstanding was only 8s. 2d., as against 8s. 9d. It would be seen therefore that they had kept everything off capital as far as they possibly could. They would not during the current year feel the full effect of the rise in the price of coal; but next year, if it kept at the present level, it would cost them £5000 more than last year. This was rather a serious matter. He had told them how it would be met to the extent of £1500; but he would like to say the new retorts which they were now using gave improved results over the old retorts; and this gain was worth £3000 a year.' Therefore they expected to pay the increased price of coal without either having to raise the price of gas or reduce the amount they had been contributing the last year or two to the rates; and he considered this most satisfactory. The Gas Committee had passed a resolution recording their high appreciation of the very efficient manner in which Mr. Bond had carried out the responsible duties devolving upon him since his appointment as Engineer, and particularly the able and expeditious manner in which he had designed and carried out the extensive alterations and improvements at the works. They also resolved that his salary be increased from £550 to £600 for the current year, with an additional increment of £50 per annum from March 31, 1908. The Committee believed they were wise in retaining Mr. Bond's services; and they had every confidence that with him as their Engineer, they would get very good results indeed from the gas-works in the future. To put it from the purely selfish point of view, it would pay them to keep him. He had very great pleasure in moving the adoption of the minutes, and in adding his personal testimony to the services which Mr. Bond had rendered to the Gas Committee, and in saying that he fully believed he deserved the increase of salary, while it was also an increase which it would pay the Corporation to make.

Several other members of the Council spoke eulogistically of Mr. Bond; and the minutes were adopted.

INSPECTION OF GAS LIQUOR AND OTHER WORKS UNDER THE ALKALI ACTS.

District Inspectors' Reports.

In the last number of the "JOURNAL," we noticed the annual report of the Chief Inspector under the Alkali Acts (Mr. R. Forbes Carpenter). To-day we give extracts from the reports of the District Inspectors.

The first district is Ireland, which is under the supervision of Mr. E. G. Ballard. There are 35 sulphate of ammonia and six tar works; 143 visits were paid and 113 tests of exit gases made last year. At one works, some little trouble arose in the early part of the year with respect to the vitriol chamber exit connected with a spent oxide set of burners. Alterations were proceeding at the time; and this, to a large extent, accounted for the high exits. However, matters were speedily rectified. At another works, in the South of Ireland, the slovenly state of the sulphate of ammonia plant, referred to in the previous report, continued, although Mr. Ballard did not find the parties contravening the Act as regards the escape of noxious vapours. With the exception of these two and one other new sulphate works in the North of Ireland, he had no reason to complain of the way in which any of the works in the district were carried on during the year; and they were all well up to the average as regards supervision and care to meet the requirements of the Act. The presence of hydrocyanic acid in the saturator gases was well impressed upon the owners of sulphate of ammonia works, and the dangerous consequences liable to follow from the breathing of this poisonous vapour by the workmen, in addition to those arising from sulphuretted hydrogen evolved. Taking all the places where sulphate is made in Ireland, the number of works absorbing the sulphuretted hydrogen in oxide of iron is 32; the number burning it, 2; those working on the continuous system of distillation, 25; and those on the intermittent system, 10. Products equivalent to 2521 tons of sulphate were made in the district during the year. The proportion of total liquor distilled by the continuous and intermittent systems was 97·5 and 2·5 per cent. Most of the tar-works registered in Ireland are those where tar is heated for the manufacture of roofing felt. They are well conducted. At one works, a still for the manufacture of refined tar has been erected. It is employed simply for the removal of the light oils. It is provided with a heap oxide purifier for the absorption of any sulphuretted hydrogen that might be evolved during the process. At the works where tar is distilled for the ordinary products, proper appliances are provided for dealing with the noxious gases given off at the worm end of the stills.

Reporting upon the North of England district, Mr. J. W. Young, B.Sc., states that there are 59 sulphate of ammonia and seven tar works under his supervision; but sulphate was produced last year in 64 works out of the total of 132 of various kinds. The output from gas-works showed an increase of only 1 per cent.; but from coke-ovens the increase was 29 per cent. over the preceding year's figures. Nine years ago the annual production in this district from coke-ovens was 2500 tons; it now exceeds 20,000 tons, and is likely to rise to a much larger figure in the near future. The total quantity of gas liquor distilled, in terms of tons of sulphate, was 29,666; the proportion distilled by the continuous process being 99·7 per cent. The average acidity of gases leaving the limestone towers of Claus plants was 0·44 grain of sulphur trioxide, or 2·5 grains lower than before. Mr. Young says the process has generally worked well, but especially good results have been obtained at one works specified, alike in yield and quality of sulphur, and in low escapes of superfluous gases. He says the way in which the process is conducted at these works is "an object-lesson to other works in the district of the value of frequent chemical tests, intelligently interpreted."

There was no serious cause of complaint against works using oxide purifiers, though in isolated instances attention had to be called to incipient foulness. At several works the system of heap purifiers has displaced boxes, with satisfaction both to the management and to the Inspector, who says: "The longer life of oxide in them, the safety of recharging, their indifference to wet weather, and, above all, the ease with which their condition is noted, are points much in their favour." The only objection he knows against them is that strong wind from the same quarter causes foulness on the lee side. But if an evil at all, it has its compensating advantage by the attendant revivifaction; while the ill-effect is completely met by judicious trimming or by a gas-tight partition. The destruction of the foul gases from the saturators by their treatment with gas liquor and subsequent combustion continues to yield satisfactory results. The chimneys into which the gases have been finally conveyed have in every test shown absence of sulphuretted hydrogen; and the average acidity of the chimney gases has been 0·64 grain of sulphur trioxide. Mr. Young says it is in favour of this method that thereby all hydrocyanic acid is destroyed, which the other methods, excepting the use of vitriol chambers, fail in practice to completely effect.

Mr. Ballard also reports upon the district comprising Cheshire, North Wales, and part of Lancashire, in which there are 23 sulphate of ammonia and eight tar works. Somewhat serious infractions occurred last year at two of the works. In one case, the escape of noxious gas was due to a neglected purifier, and in the other to an escape from a badly-fitting plug in the pipe leading from the saturator to the purifier. Representations were made to the proprietors in both cases, and, on promise of better supervision in future, proceedings to recover the statutory penalty were stayed by the Chief Inspector. Owing to the researches of Mr. Linder, as set forth in the report of the Chief Inspector for 1905, which was noticed in the "JOURNAL" at the time, it has been necessary to impress upon the manufacturers of sulphate of ammonia the importance of even more careful attention than hitherto to the prevention of escape into the atmosphere of noxious gases; the presence of hydrocyanic acid in these vapours adding greatly to their dangerous and poisonous nature. Especially is the danger great where the liquor is used as fast as it is produced, as in places where there is but little storage room. The reasons for this will be seen on careful study of the report referred to. Taking all the works producing sulphate of ammonia in the district, the number using continuous distillation plant is 23; and the proportion of liquor distilled by this process is 99·5 per cent.

As usual, Dr. J. Affleck presents an interesting report on the Widnes and Runcorn district. Referring to the sulphuric acid and sulphate of ammonia works, he says that, with the exception of two works, which for special reasons were closed for about six months, all the others were in regular operation, and towards the close of the year were even working up to their full capacity. The renewals in all sections of the plant were on a more extensive scale than for many years past. Many new sets of pyrites burners took the place of old ones, and numerous lead chambers and towers (Glover and Gay-Lussac) were entirely rebuilt. In short, no outlay of capital is being spared in the district in order to give the maximum efficiency to all the plants, by introducing every modern improvement that has stood the test of experience. Six out of the seven sulphate and muriate of ammonia works in the district were running steadily all the year; and, being all in excellent condition, they gave no trouble, nor any occasion for complaint. Dr. Affleck says the other works continue to conduct their manufacture of sulphate of ammonia and deal with the foul gases evolved by the methods described in last year's report; and they were all skilfully and carefully managed.

In the district comprising North and East Lancashire, and part of Yorkshire, there are 10 works where ammoniacal liquor is produced (being one less than in 1905), and 46 making sulphate or muriate of ammonia—an increase of one. The total quantity of liquor distilled last year, equivalent to sulphate of ammonia, was 22,570 tons; 97·7 per cent. being by the continuous process. The following were the methods of dealing with the foul gases: To vitriol chambers, 27·1 per cent.; absorption by lime and oxide of iron, 36·4 per cent.; by the Claus process, 13·4 per cent.; and by other methods, 23·1 per cent. Mr. Herbert Porter, who has charge of the district, reports that there was a slight falling off in the quantity of ammonia products, calculated as sulphate, last year, compared with 1905. This was partly due to the wider use of water gas, and partly to crude liquor being sold and used outside the district. There seems to be a greater demand for rectified liquor; and he says the figure may be expected to be larger in the future. At one works, the Claus plant is still employed for treating the sulphuretted hydrogen from the sulphate of ammonia plant. Mr. Porter says this is interesting and valuable to know, since the decision was reached to produce a polysulphide for fixing the hydrocyanide acid otherwise evolved by the distillation of coke-oven liquor; and a supply of sulphur can thus be produced from the waste gases. With this subject the Chief Inspector has dealt most fully in previous reports. The point is mentioned by Mr. Porter as he believes the works in question are the only ones employing the Claus plant in connection with the distillation of coke-oven liquor and using the sulphur produced—or, rather part of it—for the formation of polysulphide. At another very large coke-oven works, it has been decided to put down the Claus plant, and preparations are being made accordingly. At two large works, the sulphuretted hydrogen is burnt in the oxide burners for the production of vitriol. One of the chief difficulties in this method is the presence of tar in the gas. This is objectionable, as it affects the vitriol chamber process; and at one works steps have been, and are being, taken to treat the gas mechanically, to remove this mist of tar and oil.

The reports of the other District Inspectors and that of the Chief Inspector to the Secretary for Scotland will be noticed next week.

HINTS ON GOOD GAS LIGHTING.

Lecture to Ironmongers.

A Special Meeting of the London and Suburban branch of the Federated Association of Ironmongers was held on Monday last week, in the show-rooms of the Gaslight and Coke Company at the Triangle, Hackney, N.E., to hear a lecture by Mr. W. H. Y. Webber on "Gas Lighting Up to Date," accompanied by demonstrations with the various appliances contained in the room, which had been placed at the disposal of the Association through the courtesy of Mr. F. W. Goodenough, the Chief Inspector of the Company. Mr. J. H. Dunn, the President of the Association, occupied the chair; and there was a good gathering of London ironmongers and their assistants and workmen.

In the course of some preliminary remarks, the lecturer expressed his gratification at the request made by the President that he should deliver an address to the members of the Association, for he thought that ironmongers generally had reconsidered their attitude towards the merits of gas. The gas companies were quite willing to hold out the right hand of fellowship to the ironmongers; and as far as the Gaslight and Coke Company were concerned, the members knew that the Chief Inspector was very friendly to them. Turning to the subject of his lecture, Mr. Webber said the first thing to be considered in connection with gas lighting was the pressure of gas in the main; and the best working pressure for the luminous flame was 5-10ths of an inch, whether for flat-flame or argand burners. Passing on to deal with the illuminating power of gas, he referred to the various improvements made in burners during the last thirty years, and to the introduction of the Welsbach mantle and the general adoption of incandescent gas lighting. He explained the structure of the mantle, and pointed out that its durability depends on outside influence. He demonstrated this, and then passed on to refer to the maintenance system, which he said the gas companies in this country had discovered was absolutely essential for carrying out incandescent lighting satisfactorily. After describing the "C" burner, he lecturer said it worked best with a pressure of 15-10ths; but inverted incandescent burners would do with a pressure ranging from 13-10ths up to 20-10ths. He emphasized the necessity for keeping burners free from dust. In conclusion, the advantages of incandescent gas lighting, and the many ways in which it could be extended, were pointed out. Mr. Webber then replied to a number of questions put to him, and was accorded a hearty vote of thanks for his address.

Before separating, the members proceeded to inspect the stoves on

view in the Company's show-rooms, and to hear some interesting accounts of the different systems of gas lighting and heating adopted.

In connection with the lecture, cards were distributed on which were printed the following simple rules for good gas lighting: (1) Do not put an incandescent gas-light in the line of sight, but always above it. (2) Never use an incandescent light without a reflector over it, or to throw the light in the direction where it is most required. (3) If an incandescent light is likely to meet the eye within a distance of 10 feet, it must have an opal shade, independent of the reflector. (4) Allow for interior lighting by pendant lamps one "C" No. 2 Kern or a full-sized inverted lamp to every 150 square feet of floor area. For "Bijou" inverted lamps, use thrice the number if pendant, or four times if on brackets. This rule applies to lights at the usual domestic height of 6 ft. 6 in. above the floor. At the usual shop height of about 8 ft. 6 in., double the number of lights. (5) The most equal distribution of light is given by lamps spaced at 1½ times their height apart. (6) Use pilot-light burners for shops, workrooms, &c. (7) Outside shop-window lamps should be as low and as far off the glass as possible.

COLWYN BAY GAS AND WATER SUPPLY.

A North Wales District Meeting of the members of the Association of Municipal and County Engineers was recently held at Colwyn Bay under the presidency of Mr. J. Patten Barber, M.Inst.C.E., at which a paper on "The Colwyn Bay Water and Gas Undertakings" was submitted by Mr. T. B. FARRINGTON, Assoc.M.Inst.C.E., Engineer to the Conway and Colwyn Bay Joint Water Supply Board. The following are some extracts from the communication.

Colwyn Bay Gas-Works.

The first attempt at street lighting in Colwyn Bay was made in 1879, when a dozen lamp-pillars with oil-lamps were fixed by the Parochial Board; and in 1883 this number had been increased to thirty. In October of the latter year, the author was instructed by the promoters of the Colwyn Bay Gas Company to secure a suitable site and to prepare the necessary plans for an application to Parliament for a Provisional Order to authorize the construction of gas-works for Colwyn Bay and the district. The present site was arranged for, the Provisional Order was obtained in the following year (1884), and the erection of the works proceeded with.

The following is a short description of the original works: Retort-house with five retorts, one scrubber, two condensers, two purifiers, 6 ft. by 6 ft., station meter, and gasholder (15,000 cubic feet). A 6-inch trunk main was laid to Colwyn Bay, a distance of about 1½ miles. This was continued by a 5-inch main to Old Colwyn, a further distance of about 1½ miles; and a few branch mains, mostly 2-inch, were laid. The total cost of the works was about £5000. The total make of gas for the first year was 1,583,000 cubic feet; and the price was 6s. per 1000 cubic feet. There were 41 consumers, and 42 public lamps; the latter being charged at 30s. each.

In 1896, an Act of Parliament was obtained authorizing the raising of additional capital, &c., and having a clause enabling the Urban District Council to purchase the works within five years by agreement or arbitration. The works by this time had been enlarged by the addition of 37 retorts; two purifiers, 10 ft. by 6 ft.; a gasholder of 60,000 cubic feet capacity; an exhauster having a capacity of 5000 cubic feet per hour; and a Cornish boiler. The total length of mains was about 6½ miles; and the total make of gas 20 million cubic feet. There were about 3800 consumers. The price of gas for lighting was 4s. 2d. per 1000 cubic feet; and for cooking and power, 3s. 4d. There were 138 street-lamps, charged at 32s. 6d. per lamp.

Since 1897 the progress of Colwyn Bay has been unexampled in its rapidity, and constant extensions of the gas-works have been required. During that period, the whole of the works and the mains have been practically remodelled and reconstructed. The following is a description of the works as they now exist: Retort-house, containing 66 retorts; four purifiers, 12 ft. by 12 ft.; two ditto, 10 ft. by 6 ft.; three gasholders, capable of storing 15,000, 60,000, and 225,000 cubic feet respectively—a total of 300,000 cubic feet; two exhausters, having a capacity of 30,000 and 15,000 cubic feet per hour respectively; two scrubbers, one 45 ft. by 6 ft., and the other 20 ft. by 4 ft.; four annular condensers, of a capacity of 300,000 cubic feet per day; a station meter for 20,000 cubic feet per hour; two 12-inch patent water-loading governors, one for low-level and the other for high-level supply; a cast-iron underground tar and liquor tank of a capacity of 150 tons; lifting pump and two boilers. The largest gasholder was constructed in 1900.

An additional trunk main 12 inches in diameter has been laid to Groes, a distance of about 2 miles, and joined to the old 5-inch main to Old Colwyn. A new 12-inch trunk main, about a mile in length, has been laid to Llandrillo, and extended by a 9-inch main about half a mile to the new sewage-pumping station at Rhos. The total length of trunk and other mains is about 23 miles. Last year the total make of gas was 62 million cubic feet. The average illuminating power of the gas is 17 candles. Gas for lighting, cooking, and power is charged at 3s. 4d. per 1000 cubic feet; and for public lighting (350 lamps) and all Council purposes at 2s. The total capital of the works to date is £74,260. The number of meters fixed is as follows: Ordinary, 696; slot, 1150; cookers on ordinary meters, 178; cookers on slot meters, 850. The following additional works have been arranged for: Siding from railway, coal-store, elevator, coal-crusher, Livesey washer, mains, meters, cookers, and services; and a loan of £17,000 has been sanctioned for these purposes. Larger purifiers are also contemplated.

The whole of the gas now supplied for public lighting and other Council purposes is charged at 2s. per 1000 cubic feet. There are 120 incandescent and 30 flat-flame lamps, but the latter are being replaced by incandescent burners.

The author is indebted for the whole of the information respecting the works for the last ten years to Mr. John W. C. Pennington, the Engineer and Manager, who was appointed in 1897, and to whose energetic and efficient management the progress made is to a great extent due.

The following table shows the progress made:—

Year.	Gas Made.	Coal Used.	Gas Made per Ton of Coal.	Coke per Ton of Coal for Sale.	Price of Gas for Lighting and Power per 1000 Cub. Ft.	Public Lamps per Annum. Each.
	Cub. Ft.	Tons.	Cub. Ft.	Cwt.	s. d.	£ s. d.
1885	1,500,000	200	7,500	6	6 0	1 10 0
1896	20,000,000	2200	9,000	8	4 2	1 12 6
1906	62,000,000	5600	11,000	10	3 4	..

Colwyn Bay Water-Works.

The town of Colwyn Bay came into existence about 1865, when Sir John Pender purchased a part of the Erskine demesne, and proceeded to develop it as a building estate. For this purpose a water supply was necessary; and in 1867 a small reservoir, of a capacity of about 150,000 gallons, was constructed at Rhiw, about 200 feet above Ordnance datum. Mains and services were laid from time to time as required. During the next ten years some eighty houses were erected, and in 1875 the population was about 400. At this time the estate was acquired by the Colwyn Bay and Pwll-y-Crochan Estate Company; and about 1877, the development proceeding at a more rapid rate, the existing water supply became inadequate, and an additional reservoir, of a capacity of about 450,000 gallons, was constructed by the author at Rhiw alongside the old one, which was enlarged to a capacity of about 300,000 gallons; making a total of 750,000 gallons. In 1878 the Colwyn Bay Water-Works Company was formed, and the author was instructed to prepare the necessary plans for an application for parliamentary powers to carry out new works. The Act, obtained in the following year, authorized the construction of a pumping-station at Groes Mill, 130 feet above Ordnance datum, and a large impounding reservoir above Pwll-y-Crochan Woods, at an elevation of 600 feet. Only the first named of the above works was constructed; and water was raised from the Groes stream by steam-pumps through a 6-inch rising main into the existing reservoirs at Rhiw. These arrangements sufficed for the supply of the district until 1886, when the works were purchased from the Company by the Conway Rural Sanitary Authority. A further supply of water being urgently needed, arrangements were made with the Llandudno Commissioners for them to provide it from their mains near Llandudno Junction; and the author was instructed to lay about 4 miles of 6-inch pipes to convey the water to Colwyn Bay. The population continuing to increase at a rapid rate, an augmented supply of water had again to be sought for; and in 1890 it was decided to join with the borough of Conway and the Conway Rural Sanitary Authority in procuring such a supply as would meet the necessities of all three authorities. Plans were prepared by the writer for obtaining a supply from Lake Cowlyd; and the Conway and Colwyn Bay joint water supply district was constituted by virtue of a Provisional Order of the Local Government Board, dated June 10, 1891, "for the purpose of procuring a common supply of water for the constituent districts." The following is a description of the works then proceeded with.

The supply of water for the constituent districts is obtained from Llyn Cowlyd—a natural lake, situated in the heart of the Carnarvonshire range of mountains, about 18 miles from Colwyn Bay, 3 miles from Trefriw, and 2 miles from Capel Curig. Its extreme length is nearly 1¾ miles, and its extreme width more than ¼ mile. The surface of the lake is 1169 feet above Ordnance datum, and it has an area of about 200 acres. The watershed, which has an area of about 1100 acres, is free from human habitation or cultivated land, and rises precipitously on one side to a height of 2621 feet, and on the other to a height of 2213 feet. It is closed in at the Capel Curig end by a slighter elevation of about 1450 feet. The natural outlet of the lake is at the north-eastern end. The average rainfall at Cowlyd for the sixteen years 1891—1906 was 76·61 inches. The water is most excellent.

The compensation water to be delivered into the stream is 1,552,000 gallons during every working day of twelve hours, and a sufficient supply for cattle on the seventh day. To secure this amount of water, together with that required for the supply of the district, there was constructed across the end of the lake an embankment 176 yards in length, which impounds 14 feet, or about 800 million gallons, of water. The central portion of the embankment is formed of earthwork. It has an inner core of concrete, and the end portions have inner puddle walls. Both the concrete core and the puddle walls, which are keyed into each other, are carried down into impervious strata. The inner slope of the embankment is 3 to 1, and the outer slope 2 to 1, the inner slope being pitched with stone grouted with cement, and the outer slope revetted with grass. There is a roadway 9 feet wide along the top of the embankment, and a storm-wall at the top of the inner slope 4 feet high. The top water-level of the lake is 4 feet below the level of the top of the bank. The waste weir is 30 feet wide, and is formed of concrete; the inner slope being pitched with masonry grouted with cement. It is crossed by means of a lattice-girder bridge of 30-feet span, continuing the roadway along the top of the bank.

The water is drawn from the lake through a cast-iron stand-post 18 feet high and 3 feet internal diameter, with two 24-inch valves, at 7 feet and 14 feet below the top water-level, regulated by gearing from the top of the post. Owing to the peculiar configuration of the bottom of the lake at the embankment end, it was found necessary to erect the stand-post at a distance of 282 feet from the embankment; and it is approached by means of a lattice-girder bridge supported on cast-iron columns with diagonal bracing, and having six spans of 42 feet and one of 30 feet. The stand-post and the columns supporting the girder bridge are securely bolted down on concrete bases.

Water is drawn from the lake through spigot and faucet cast-iron pipes, 24 inches internal diameter. They are laid from the stand-post, a distance of 492 yards, to the gauge chamber—a stone building 1154 feet above Ordnance datum, 26 ft. by 25 ft., with a slate roof, and of very substantial construction. It contains the necessary machinery for controlling the supply of water to the district, and for regulating the compensation water which is delivered at this point into the stream. The

water from the 24-inch pipe is first of all discharged into an open tank, and passes through submerged orifices into a second tank; the object being to break the velocity of inflow. From the second tank the compensation water is delivered through an orifice into a cast-iron trough 2 feet wide, over a test basin into the stream. From the second tank the water for the supply of the district passes through screens having a fine copper mesh into a third tank, and is controlled by a 15-inch valve with grating. The tanks are constructed of concrete. From the gauge chamber the water is conveyed in stoneware pipes a distance of 4100 yards down the valley to the overflow tank, which is 750 feet above Ordnance datum. The pipes are double lined, 15 inches and 12 inches internal diameter, according to inclination, with brickwork inspection chambers, having cast-iron self-locking covers at every change of inclination or direction. The gradients vary from 1 in 11 to 1 in 137.

The overflow chamber near Tai Isaf Ardda is constructed of brickwork in cement, with cast-iron self-locking cover. From the overflow chamber for a distance of 550 yards the water is conveyed in cast-iron pipes, 12 inches internal diameter, to the pressure-relieving tank at the top of Dolgarrog Woods, 500 feet above Ordnance datum, from which the supply to the district is drawn. There is a bye-pass arrangement at this point. The total length of pipes from the lake to the pressure-relieving tank is about 3 miles. The supply to the district is regulated by means of a special valve; and any surplus water coming down from the lake is forced back and discharged into the stream at the overflow chamber, 750 feet above Ordnance datum—this being one of the conditions arranged with the riparian owners, so that the water discharged at this point can be utilized for other purposes.

From the pressure-relieving tank the water flows in spigot and faucet cast-iron mains, 12 inches internal diameter, through the Dolgarrog Woods for a distance of 500 yards to the main road, at an average gradient of 1 in 3. The line of pipes is continued along the main road, with a few slight deviations, through Talybont, Conway, Llandudno Junction, and Colwyn Bay to Pwll-y-Crochan Avenue, whence it is continued in 9-inch cast-iron pipes through Colwyn Bay and Colwyn to Llysfaen—a total distance of over 18 miles from the lake. Wash-outs of 6 inches internal diameter, with valves, are placed at the lowest points of the main, and double air-valves at all the highest points. Hydrants and sluice-valves are also fixed at numerous places along the line. The whole of the cast-iron pipes were tested at the works to a pressure of 400 lbs. to the square inch, and afterwards on the ground before laying.

Among the special works constructed along the pipe-line from Dolgarrog, the most important is at Conway, where the pipes are carried over the river by means of a steel wire rope suspension bridge, at a height of 20 feet above the highest spring tides, 326 feet span, erected between the Conway tubular and suspension bridges. The masonry in the pier abutments is of Anglesey limestone, moulded to match the existing structures. The piers are of lattice form, braced together with cross girders. There are three cables at each side of the bridge, carried over rocking quadrants on the top of piers; the two outer cables being $1\frac{3}{4}$ inches and the inner cable $2\frac{1}{4}$ inches diameter. From these the platform is suspended by means of rods $\frac{3}{4}$ inch diameter, fixed alternately to the two outside cables and the inner cable by special clips; the bottom of the rods having small T cross girders diagonally braced with eyes at each end, through which the suspension rods pass with nuts underneath, so that the length of the rods can be regulated. Channels are fixed 6 feet apart on the cross girders; and in these the wood platform is constructed. The two lines of steel cables are 18 feet apart at the piers, and are drawn in at the centre of the bridge to 9 feet apart; the object being to make the bridge as rigid as possible and prevent swaying. The platform is 6 feet wide, and carries two lines of pipes of 9 inches internal diameter, with expansion joints at each end of the bridge. The cables at each end are attached to forged steel rods, carried down into anchorages in the solid rock, and bolted through bed-plates secured with concrete. The whole of the metal used in the construction of the bridge is steel.

The total cost of the works which were designed and carried out by the author, including the purchase of the lake and watershed, easements, &c., was £55,000.

In order to supply the higher levels of Colwyn Bay, a pumping scheme has been carried out by Mr. William Jones, Assoc.M.Inst.C.E. A somewhat similar scheme had been previously designed and constructed by the author for the supply of the higher parts of Llysfaen. These works include a pumping-station at Old Colwyn, with gas-producer plant, engine, and pumps capable of lifting 5000 gallons of water per hour 580 feet high through about $1\frac{1}{2}$ miles of rising main 6 inches internal diameter to a covered concrete service reservoir. The total cost of the works was about £8000.

Owing to the unflagging growth of the population of Colwyn Bay, the Joint Board find the present main insufficient for the requirements of the town; and they have applied to the Local Government Board for powers to borrow £25,000 for the purpose of laying down an additional main, 15 inches diameter, from Colwyn Lake to Colwyn Bay. By direction of the Board, the route for this new main has been surveyed by the author, who has prepared the plans for the scheme.

METROPOLITAN WATER BOARD.

The Metropolitan Water Board, as re-constituted after their first term of office, met on the 7th inst.—Mr. J. Glass, the Vice-Chairman of the old Board, presiding during the opening proceedings.

The first business was the appointment of a Chairman and Vice-Chairman. Mr. T. W. L. Emden proposed, and Mr. Pritchard seconded, the appointment as Chairman of Sir Melvill Beachcroft, the late Chairman; and Mr. Cole proposed, and Mr. Watts seconded, the selection of Mr. E. B. Barnard, M.P., for the position. Sir Melvill Beachcroft was declared elected by 28 votes; Mr. Barnard receiving 25 votes. Sir Melvill Beachcroft, on taking the chair, said he recognized that the office of Chairman of the Board ought not to be regarded in any sense as freehold. In the ordinary course of things, it was undesirable that any particular Chairman should be regarded as a permanent occupant of the position. On the other hand, however, there were reasons why he ought not, perhaps, to refuse to continue in office, at any rate for a short time longer. The Board's Charges Bill was still going through the House of Commons; and this measure, if passed, would be their charter for the future. It might not, therefore, be disadvantageous that one who had watched the proclivities of the Board with assiduity from the first should be able to render further help in the immediate future. However, the moment he felt that their organization was on a satisfactory basis, he would be prepared to give place to some one else in the chair. Mr. Barnard was unanimously appointed Vice-Chairman.

The Board then proceeded to deal with the reports of Committees. The Works and Stores Committee submitted a proposal to increase the pumping capacity at their Hampton (Sunnyside) station by the erection of two Diesel oil-engines, for the purpose of driving centrifugal pumps, each capable of delivering 20 million gallons of water per day from the river to the reservoirs. At present there are two quadruple expansion engines, driving centrifugal pumps, used for the purpose of filling the Sunnyside and Stain Hill reservoirs, and capable of delivering 20 million gallons of water from the river to the reservoirs in 24 hours. The Chief Engineer (Mr. W. B. Bryan, M.Inst.C.E.) advised that as long as the reservoirs were used for the purpose of storage or to provide against flood, this pumping capacity was sufficient; and that, in order to enable the whole of the supply to be passed through the reservoirs previous to its being admitted to the filter-beds, it was necessary to considerably increase the power available at this station. The estimated cost of the proposed engines was £5360. Mr. Fitzroy Doll drew attention to the fact that these oil-engines were not only to be of the Diesel type, but were to come from Winterthur. He said very good oil-engines were made in this country, and he certainly hoped the Board would use English oil-engines. Mr. W. Whitaker Thompson wished to know what was to be the horse power of the engines, and suggested whether it would not be more economical and better for the Board to erect engines driven by producer gas. Had the Committee considered the relative cost of oil and producer-gas engines? Mr. A. H. Tozer moved that the report be referred back to the Committee for further consideration. Mr. J. Lea-Smith seconded the motion. Mr. H. Ward hoped the matter would be referred back, because he thought the engine proposed was a very experimental one. It had not yet achieved an assured success. Mr. Emden thought an effort might be made to obtain estimates from English makers of engines. Mr. C. E. Hearson said Diesel engines were being made in England, but not of the large size required, for the reason that we had not the machinery for making them. He opposed the reference back, because he believed nothing would be gained by it. The Vice-Chairman (Mr. Barnard) stated that the engines were each to be of 300 H.P. Originally it was contemplated to have gas plant; and the Engineers had made a great many journeys, and inspected nearly all the different types of engines. The reason why finally they put aside the gas plant was that there was not room at the station for the erection of the necessary machinery. Ultimately the matter was referred back to the Committee.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

In the Edinburgh Town Council on Tuesday, Mr. W. W. Macfarlane called attention to the illuminating power of the gas, which, tested at Canonmills gasholder station on May 28, was only of 18·46-candle power. Lord Provost Gibson pointed out that the test was made at Canonmills, and they all knew that gas deteriorated in quality in the course of its transmission. There was only one testing-place—viz., at Granton. Bailie Stevenson asked why this test had been taken at Canonmills. To this question Mr. Mallinson replied that out of courtesy, and at the request of the Town Council, tests were taken at different parts of the city; but the official testing-place was at Granton. This seemed to satisfy the inquisitors, as the subject was passed from.

The Council, by a majority, adopted the scheme for the reorganization of the street and stair lighting in the city, which was explained in these "Notes" last week.

The annual meeting of shareholders of the Bothwell and Uddingston Gas Company, Limited, was held on the evening of Tuesday of this week. The Directors reported that the balance at the credit of the revenue account was £2568. A balance of £1139 was brought forward from the previous year; and, after paying a dividend at the rate of 10 per cent., there has been carried forward into the current year £1308. Gas sold amounted to 53,926,600 cubic feet, an increase of 3,428,000 cubic feet, and yielded £6625. There was received for coke, £2401; from tar, £426; and from sulphate of ammonia, £1343. The total revenue was £10,865. There was no capital expenditure during the year. The cost of 8534 tons of coal was £3346; and of cartage, £684. The average price of coal delivered was 8s. per ton; and the revenue from residuals was at the rate of 9s. 10d. per ton of coal. The price of gas has been retained at 2s. 6d. per 1000 cubic feet.

The Selkirk Town Council on Monday had before them a very exhaustive report by Mr. W. R. Herring of Edinburgh, upon the value of the undertaking of the Selkirk Gaslight Company, which it is proposed to acquire. Mr. Herring inspected the works on April 26, and was furnished with balance-sheets of the Company for the ten years from 1897 to 1906, inclusive. The Corporation own several shares in the Company, which gives them access to the balance-sheets—a situation which does not always exist in transfers. The Company have been under agreement with the Town Council not to pay more than 10 per cent. dividend; but during the whole of the ten years under review, and previously, they have paid 10 per cent. Mr. Herring accordingly concluded that the question of purchase resolved itself into purchasing the sum which had been paid in dividend, averaged over a period of years, subject to allowances for deficiencies of plant, or for plant in excess of reasonable present requirements, if any. For the past ten years a sum of £453 10s. per annum had been distributed as dividend. In view of the fact that the Company's property was in a good state of repair, he considered that 25 years' purchase of

this sum was a fair valuation, which would amount to £11,337 10s., less £1250 for ascertained deficiencies of plant. This left a net sum of £10,087, to which must be added £1400 of investments; cash at bank, £1102; and outstanding accounts and stocks at valuation—these three figures amounting to £3621. Provost Sim moved that the sum of £10,080 be offered to the Company. He mentioned that the Company had had their undertaking valued at £25,800; but he pointed out that shares in the Company had not been known to be sold for more than £11, whereas the offer of the town was equal to £15 per share. The shareholders would have £13,700 to distribute; and as the original capital was only £4535, they would have a profit of over £9000. He thought their offer was a very fair one, and that the transaction would be a profitable one for the burgh. The motion was adopted.

At the Dumfries Town Council last week, tenders for the supply of coal were accepted; the total amount being £9261. The average price is 16s. 3d. per ton.

Mr. Scott, the Convener of the Gas Committee of the Denny Town Council, reported on Tuesday evening that they had received tenders for the supply of coal for the year at an average price of 12s., which was 2s. 9d. more per ton than they paid last year. The extra cost would be about £200, and would necessitate an increase of 5d. per 1000 cubic feet in the price of gas. The tenders were accepted; and the question of the price of gas will be considered when the annual accounts are before the Council.

In the Peebles Town Council on Monday, Treasurer Forrester called attention to the fact that £64 had been paid as bonus to the gas-workers.

The Broughty Ferry Town Council, at a meeting last Monday, unanimously resolved to grant the Gas Manager—Mr. G. Keillor—an increase of £25 to his salary; bringing it up to the sum which had been paid to his predecessor.

The Wishaw Town Council on Monday considered the price of gas for the current year. The Gas Committee recommended that the price of gas be raised by 6d.—from 2s. 5d. to 2s. 11d. per 1000 cubic feet. After some discussion, the increase was agreed to.

It was reported to the Johnstone Town Council on Monday that as the result of the year's working of the gas undertaking there was a credit balance of £40.

At the monthly meeting of Kirkintilloch Town Council on Monday, the Manager—Mr. J. M'Leod—reported that the gas made during the twelve months amounted to 58,738,000 cubic feet; being 4,135,000 cubic feet more than in the previous year, and equal to 7·57 per cent. The net cost of wages and materials was 0·93d. per 1000 cubic feet. Coal cost 8s. 10½d. per ton, as compared with 8s. 3½d. in the previous year. The quantity carbonized was 6654 tons—300 tons more than in the preceding year; and the yield of gas per ton was 110 cubic feet more.

At the annual meeting of the Leven (Fife) Gas Company, on Wednesday, it was reported that the quantity of gas made during the year was 31 million cubic feet—an increase of 2,600,000 cubic feet. A dividend at the rate of 7½ per cent. was declared.

CURRENT SALES OF GAS PRODUCTS.

Week ending June 15.

The London market for tar products has remained generally in a firm position. The pitch shipping season is nearly over, and the principal makers have had no surplus lots to put on the market; so the value recently attributed to this article for prompt delivery was purely nominal. For next half year, business has been repeatedly done at 30s. net at makers' works. Benzol 90 per cent. continues temporarily weak; and business is reported at 9½d. net. Creosote oil is very strong, and it is doubtful whether any large quantity could be bought below 3d. net. Crude carbolic acid continues steady. The improvement in sulphate of ammonia is maintained; the closing price being £12 to £12 2s. 6d. on Beckton terms.

Sulphate of Ammonia. LIVERPOOL, *June* 15.

Although available supplies have been in small compass, the large makes having for the most part been sold in advance, the market has been quiet, and prices have been slightly in favour of buyers. The closing quotations are £11 15s. per ton f.o.b. Hull, £11 18s. 9d. to £12 per ton f.o.b. Liverpool, and £12 1s. 3d. to £12 2s. 6d. per ton f.o.b. Leith. In the forward position, nothing of importance has transpired, though it is reported that lower prices are being quoted abroad. Makers, however, are firm at the present advance, and meantime buyers decline to follow.

Nitrate of Soda.

This article is firm, and prices have advanced to 11s. 1½d. per cwt. for 95 per cent., and to 11s. 4½d. for refined quality.

Tar Products. LONDON, *June* 15.

Prices have been practically without alteration during the week, and the firmness of pitch for forward delivery, and creosote all round, continues. In pitch, makers are still very firm in their ideas for forward delivery; and though dealers are at present unable to pay the prices asked by them, Continental consumers appear to be rather more disposed to advance their limits than was the case a week or so ago. For prompt delivery, there is not much to be sold; and it is now so late in the season that makers may have to accept even a little under ruling figures to get rid of any quantity. Creosote remains very firm indeed. London manufacturers now ask from 2⅝d. to 3d. for forward delivery; while for prompt, they are practically out of the market, though small quantities of second-hand oil are sold from time to time at reasonable terms. In the Midlands, it is improbable that anything under 2½d. would be accepted; while in the North, prices are still from 2½d. to 2⅝d. There is really no alteration in 90 per cent. benzol, and there does not appear to be any demand for same. Consumers in all directions report having heavy stocks, and being unable to take delivery of any further quantity just at present. Benzol, 50-90's.,

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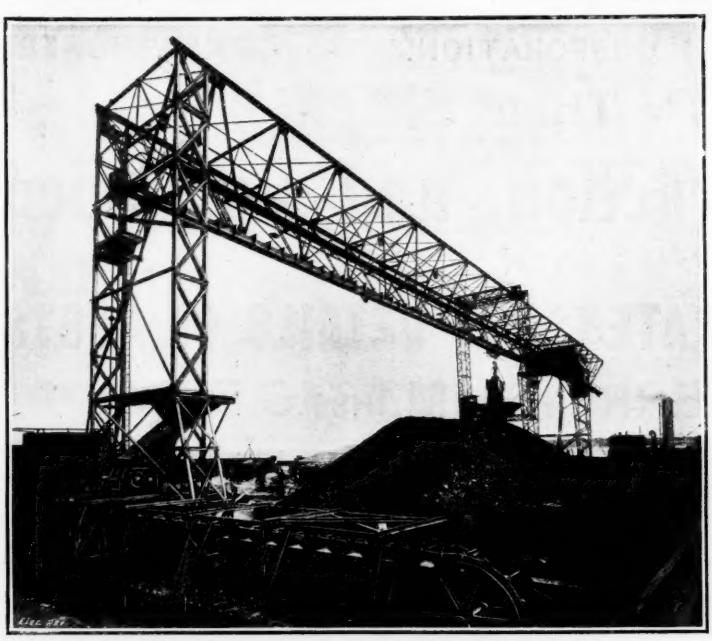

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and toluol are both very quiet; and here again it is almost impossible to do business. Solvent naphtha is without change. In the North, parcels still continue to be sold for prompt delivery at low figures; but in London, manufacturers, being well sold, are able to maintain their prices. Carbolic acid is again weaker, and it is probable that the covering in which had to be done by dealers has been accomplished during the last fortnight, and we shall now revert to the conditions which prevailed from three weeks to a month ago.

The average values during the week were: Tar, 15s. 6d. to 19s. 6d. Pitch, London, 26s. 6d. nominal; east coast, 25s. 3d. to 25s. 9d.; west coast, 24s. to 25s. Benzol, 90 per cent., 8½d. to 9½d.; 50-90 per cent., 9½d. to 10d. Toluol, 1s. 0½d. to 1s. 1½d. Crude naphtha, 4½d. to 4⅝d.; solvent naphtha, 1s. 1d. to 1s. 3½d.; heavy naphtha, 1s. 2d. to 1s. 4d. Creosote, London, 2⅜d. to 2⅝d.; North, 2¼d. to 2⅜d. Heavy oils, 3d. to 3⅛d. Carbolic acid, 60 per cent., 1s. 7⅜d. to 1s. 8d. Naphthalene, £6 10s. to £10 10s.; salts, 35s. to 45s. Anthracene, "A" quality, 1½d. to 1¾d.

Sulphate of Ammonia.

This article is steady, but there has not been very much business doing. London manufacturers would still sell for prompt delivery at £11 15s. on Beckton terms; but the principal London Gas Companies, being well sold, maintain their quotations of £12 2s. 6d. to £12 5s. In Leith, there is very little prompt stuff to be obtained; and though dealers would probably pay £12., they have refused offers of £12 2s. 6d. On the part of manufacturers, however, the desire appears to be to sell some quantity for forward delivery, for which they ask £12 5s.; but they are not able to obtain this price just now. In Liverpool and Hull, markets remain unchanged; £11 17s. 6d. to £12 in the former place, and £11 15s. in the latter place, being about the market values.

COAL TRADE REPORTS.

Lancashire Coal Trade.

All classes of fuel in Lancashire are finding a ready sale, not even house coal furnishing decreased returns. This is attributable to the cold, wet weather prevailing. Both Manchester and Salford Corporations have placed their gas coal and cannel contracts for the ensuing twelve months at from 2s. to 3s. advance on those for last year. Engine fuel is in greatest demand. Coal for shipping is being exported in considerable quantities, both from the Ship Canal and from Liverpool. The Baltic ports being now open, a brisk trade is being done from Hull and Grimsby docks. From South Yorkshire pits engine fuel is being contracted for at about 12s. per ton. Full time is being worked at the pits. There is no change to report in quotations.

Northern Coal Trade.

There is a full demand for coal generally, one exception being in best steams. Best Northumbrian steams are 14s. 6d. per ton f.o.b., second-class steams from 14s. to 14s. 3d., and steam smalls are firm at from 10s. to 10s. 3d. There is a full output at most of the collieries, and, except where there is a delay of steamers, the production is well taken up; while forward orders seem to be fairly numerous. In the gas coal trade, the demand is extremely good for the season, and deliveries on the old contracts are fully claimed. For occasional cargoes, the price quoted for Durham gas coals varies from about 13s. to 14s. 6d. per ton f.o.b., while a higher quotation is made for special classes. As to contracts, those for Riga have been settled, at prices that are expected to leave from about 14s. 6d. to 15s. per ton f.o.b., according to quality, and with the variation that different estimates of the freight may make. Other contracts have also been made; and while prices vary, all show substantial advances. There are sales also being made for forward export that seem to show some possibility of continuation of the high prices. Coke is steady, and gas coke is in moderate supply. Good gas coke is quoted from 15s. to 15s. 6d. per ton f.o.b.

Scotch Coal Trade.

There is no change to record. The volume of business is very large, the shipping trade being at its height for the season. Prices are not advancing in the meantime. The quotations are: Ell 12s. to 13s. 6d. per ton f.o.b. Glasgow, splint 12s. to 12s. 3d., and steam 11s. 9d. to 12s. The shipments for the week amounted to 278,773 tons—a decrease of 31,971 tons upon the previous week, but an increase of 45,008 tons upon the corresponding week of last year. For the year to date, the total shipments have been 6,083,509 tons—an increase of 300,814 tons upon the corresponding period of 1906.

Nottingham Gas Undertaking and the Rates.

When presenting the budget to the Nottingham City Council, Alderman Fraser said the Finance Committee proposed to take from the gas undertaking, in aid of the rates, the sum of £27,000, which was the same as last year. In this matter, however, they were in some difficulty, as usual, inasmuch as the accounts of the department had not yet been made up. He did not think they would be justified in taking more than last year, because there were some untoward circumstances in connection with the undertaking which, to his mind, made it inexpedient. For instance, as the Council knew, they were threatened with several actions by persons who had suffered, or alleged they had suffered, very heavy losses owing to the management of the concern. This they had to provide for, if they should result adversely to the Corporation. Then the cost of coal had risen considerably, and probably would for a time remain high. Thirdly, there was a demand, more or less insistent, that the cost of gas should be reduced to consumers. Then he had no doubt some of the members had an uneasy feeling that in the immediate future a very considerable sum would have to be expended on the works, which would seriously reduce the reserve fund—in his judgment, none too large at the present moment. Having regard to these reasons, he thought they would not be justified in taking from the undertaking more than the sum set down—£27,000.

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Price of Gas at Swadlincote.

The Lighting Committee submitted at last Tuesday's meeting of the Swadlincote Urban District Council a balance-sheet showing a loss on the past year's working of the gas undertaking amounting to £1503, due largely to disbursements from revenue on permanent works. Gas and meter rents (less discounts) figured at £6923; residuals realized £1570. The amount of principal repaid was £1419, and of interest £2046. In view of the serious loss, the Committee recommended the Council to increase the price of gas to its former level, by putting it up 3d. per 1000 cubic feet, and to revise the application for a loan of £3000 authorized at the last meeting, so that they might include within it some of the capital charges defrayed from revenue. Submitting the report, Mr. Belfitt, the Chairman of the Committee, called attention to the fact that the Committee had spent from revenue £1291 which ought to have been provided by a loan. The actual loss on the year's working was therefore £211; but they had paid, to repair a mistake of past years, £137 extra for taxes, and had written off £89 bad debts, which should have properly been spread over a number of years. After a long discussion, the Council negatived the Committee's recommendation that the price of gas be increased, and accepted the balance-sheet.

Increase in Price at Leek.

As was briefly recorded in the "JOURNAL" a fortnight ago, recommendations of the Leek Gas Committee that application should be made to the Local Government Board for a loan for extensions, and that the price of gas should be increased, were adjourned by the Urban District Council. When the Council next met, the matters came up again; and a letter was read from the Leek Ratepayers' Association, sending a resolution passed at a public meeting protesting against the price of gas being increased, and asking that there should be a public inquiry into the working of the Gas Committee. The letter and resolution were referred to the Gas Committee. Consideration was then given to the following proposals made by the Committee: That as from Midsummer next the price of gas to ordinary consumers be advanced from 2s. 9d. to 3s. per 1000 cubic feet, subject to the usual allowances of 6d. per 1000 feet for prompt payment, and to the further discount in the case of power consumers. That from the same date the discount to prepayment consumers be at the rate of 3d. per 1000 cubic feet, instead of 6d. That the price of coke be advanced 2d. per cwt. That during the current financial year the Manager be requested to reduce his stocks of materials on hand by £400. That application be forthwith made to the Local Government Board for their sanction to a loan of £3000 on account of prospective extensions during the next two years. The summary of the accounts showed that there was an adverse balance on March 31 of £2613; and the recommendations were made with a view to meeting this. A long discussion took place, in which it was pointed out that the reason for the adverse balance was the payment of money for extensions out of revenue, instead of borrowing it. The proposals were ultimately carried.

Extension of Automatic Street Lighting at Bournemouth.

The Bournemouth Town Council had before them, at their meeting last Tuesday, a report by Messrs. G. Hemington and N. Wright on the automatic street lighting in the borough, which, as may be remembered, is on the Gunning system. They stated that during the past twelve months of the lighting, extinguishing, &c., of the public lamps, which are fitted with automatic controllers, the cost of gas was £641 9s. 7d., against £694 3s. 8d. for the same number of lamps without controllers for a similar period; showing a saving on the gas account of £52 14s. 1d. The number of nights the lamps with controllers were lighted was 358 (on seven nights owing to the men's holidays the lamps were not lighted), against 331 nights in the case of those lighted by hand. The difference is accounted for by not lighting on 27 moonlight nights. The number of lamps fitted with controllers is 561; the total number of lamps in the borough being 1975. With regard to the maintenance of the mantles and the cleaning of the lamps (done by the Automatic Light-Controlling Company's men), and the rent of the controllers, the cost of which was £344 12s., against £426 18s. for lamps without automatic controllers, the result shows a saving of £82 6s. on the maintenance account. Assuming that the lamps along the main roads which are burning from midnight to sunrise were not fitted with controllers, and had to be lighted and extinguished by hand, it would necessitate the employment of two men for this work, at an additional cost of £52 for the year. This shows that the total amount saved for the period dealt with was, in round figures, £187. The Inspectors reported that the lighting, extinguishing, cleaning, &c., of the lamps fitted with automatic controllers had been satisfactorily carried out. The Lighting Committee recommended that the number of lamps should be increased by 280 in each of two additional districts for a term of three years, and that a new agreement should be entered into covering these and the 561 controllers already in use; the terms to be generally the same as those at present in force—viz., 12s. 3½d. per lamp per annum for the lighting, maintenance of the clock, and provision of mantles—but with the option to purchase at any time during the term of the agreement. The recommendation was agreed to.

Gas Testing in Camberwell.—At the meeting of the Camberwell Borough Council on Wednesday, the General Purposes Committee reported, with reference to the report by Alderman Hearson on the subject of gas testing, which was submitted to the Council on April 17 (*ante*, p. 250), that they had considered a communication from the London County Council referred to them. In the course thereof it was stated that the point raised in Alderman Hearson's report would be borne in mind by the Public Control Committee of the Council when they had under consideration any proposals for the amendment of the law on the subject of gas testing. The Committee recommended that a copy of the report in question should be sent to the South Metropolitan Gas Company, accompanied by the request that they should offer some observations upon it. The recommendation was agreed to.

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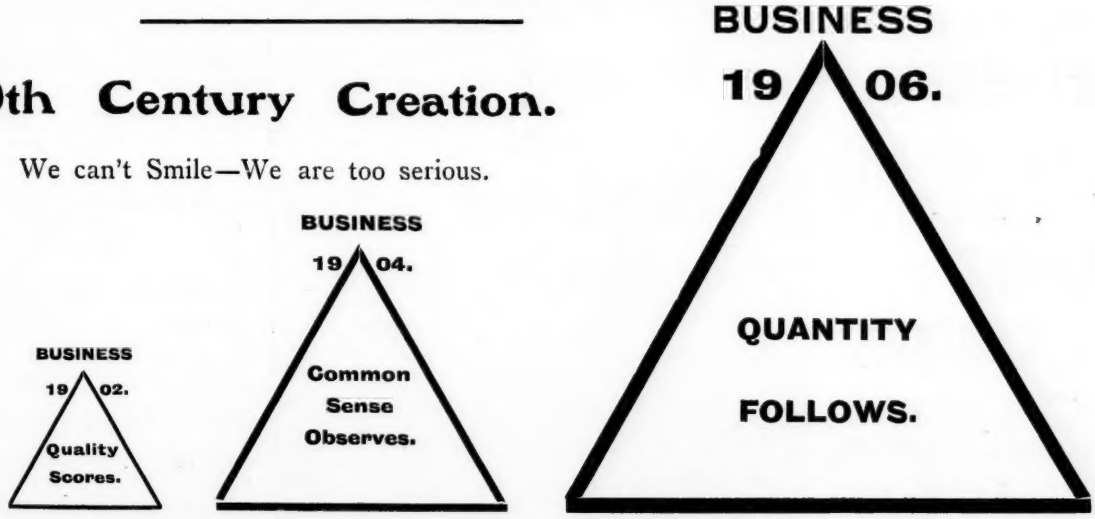

THE IMPERIAL STOVE CO., Old Town Foundry, **LEAMINGTON.**

Gas-Mains under Tramways.—By an application to the Board of Trade, which was heard at Erith on April 23 and 29, before Mr. T. C. Ekin, M.Inst.C.E., M.Inst.M.E., as Referee, the West Kent Gas Company sought payment of £330, being the balance of £671, for mains buried under the concrete of the Erith District Council's tramway, and which are therefore not readily accessible. The award is in favour of the Company, for the full amount claimed, together with all costs.

Plymouth and Stonehouse Gas Company.—In their report for the year to March 31, the Directors state that notwithstanding a large increase in the cost of coal and oil, coupled with a smaller revenue from gas used for power purposes and from cooker rents—due to concessions to consumers—the results are highly satisfactory. They recommend a dividend for the past six months at the rate of 6⅛ per cent. per annum on the ordinary stock, 9s. 9d. per share on the additional shares, and 9s. 3d. per share on the new shares—less income-tax. This will leave £14,268 to be carried forward. The report adds that there was an increase of about 2 per cent. in the quantity of gas sold, which is satisfactory, considering depression in trade and other adverse conditions. The state of the coal market has caused the Directors much anxiety; but fortunately a portion of the Company's requirements for the current year was secured last autumn at only a slight advance over running contracts. The balance, however, will involve a considerable increase in the cost of the total supplies. The price of gas coals may be reckoned as having advanced by about 40 per cent. since the spring of last year.

Tiverton Gas Supply.—At the meeting of the Tiverton Town Council on Monday last week, the twelfth annual report on the gas undertaking of the Corporation was presented. It showed a gross profit of £2502 in the twelve months to March 31 last. The lighting rate (4s. 1d.) was reduced by 5d. per 1000 cubic feet, and thus became the same as the price for cooking (3s. 8d.). This is equivalent to a reduction in revenue of about £380. New purifiers at a cost of £2240 have been put in. At the end of the year, 683 stoves were in use—an increase of 123. The total number of consumers at the end of the financial year was 1189, of whom 564 had prepayment meters. The Lighting Committee recommended that the price of gas should be reduced from 3s. 8d. to 3s. 6d. per 1000 cubic feet, which they thought, under the circumstances, they were justified in doing. They also reported that, the three years for which the Gas Manager (Mr. C. Jeffrey) was appointed being about to expire, they had under consideration the terms of his appointment; and they recommended that his salary be increased to £250 per annum as from Midsummer next, in which case he would bind himself to remain in the Council's service for another three years. In moving the adoption of the report, Mr. J. Thorne said that during the time Mr. Jeffrey had been with the Council the price of gas had been considerably reduced; and he thought this had been brought about by the zealous way in which their Manager had discharged his duties. After some remarks, the Committee's recommendations were adopted.

Increase of Price at Leigh.—By 23 votes to 6, the Leigh Town Council have decided to increase the price of gas from 3s. to 3s. 3d. per 1000 cubic feet, as from July 1.

Arundel Water Supply.—His Grace the Duke of Norfolk is again materially assisting the Arundel Town Council in the matter of its water supply. For domestic purposes he has now agreed to give 77,000 gallons per diem; and if more is required the Corporation are to pay 1s. for every extra 1000 gallons.

Gas Explosion at Sheffield.—A gas explosion by which two men were somewhat injured occurred at the Green Dragon Hotel, Sheffield, last Friday afternoon. An employee of the Gas Company named Marsh was engaged repairing the meter, in which work he was being assisted by Fisher, the "boots." After, as he thought, making things secure—it is reported by turning off the gas and "stopping the outlet with a piece of paper"—Marsh left the spot, and subsequently returned with a lighted candle, when the accident took place.

Price of Gas for Power at Burslem.—The Burslem Gas Committee announce that, in order to further encourage the use of town gas for power purposes, they have decided to reduce the charges for gas used in engines, after the date of reading for the September quarter, in accordance with the following scales, less 2d. per 1000 cubic feet discount on accounts paid within one month: Up to 25,000 cubic feet, 2s. 6d. per 1000 cubic feet; over 25,000 and up to 50,000 feet, 2s. 5d.; over 50,000 and up to 75,000 feet, 2s. 4d.; and over 75,000 and up to 100,000 feet, 2s. 2d. The price of gas for lighting and heating purposes consumed through an ordinary meter will be 2s. 8d. per 1000 cubic feet, less 2d. discount; and to slot consumers within the borough the charge will be 3s. 4d. per 1000 feet, less 6d. discount.

The Carlisle Town Council, after a very full debate, have rejected, by 18 votes to 10, the following resolution: "That a grant of money, by way of gratuity, be made to Mr. C. B. Newton, in recognition of his past services in connection with the Geltsdale water scheme." Mr. Laing, who moved the resolution, pointed out that since Mr. Newton ceased to be Engineer, the *personnel* of the Council had become materially changed; but he asked the new members, though they had little connection with the matter, to give their assistance in solving "this very troublesome and sore question."

Messrs. Joseph Taylor and Co. have received from the Sunderland Gas Company, for their Hendon works, a repeat order for one of their best and latest makes of solid-plate lead saturators, fitted with plate lead well and detachable ammonia, acid, and steam pipes, to be available either for fishing or discharging, and to make 8 tons of suphate in 24 hours. A similar order for a saturator, with well and cradle, has been placed with the firm by the Cardiff Steam Coal Collieries, Limited, for their Llanbradach works. A further order is for a wood-lined tank and lead-lined trough and pipes, &c., for the City of Birmingham Gas Department.

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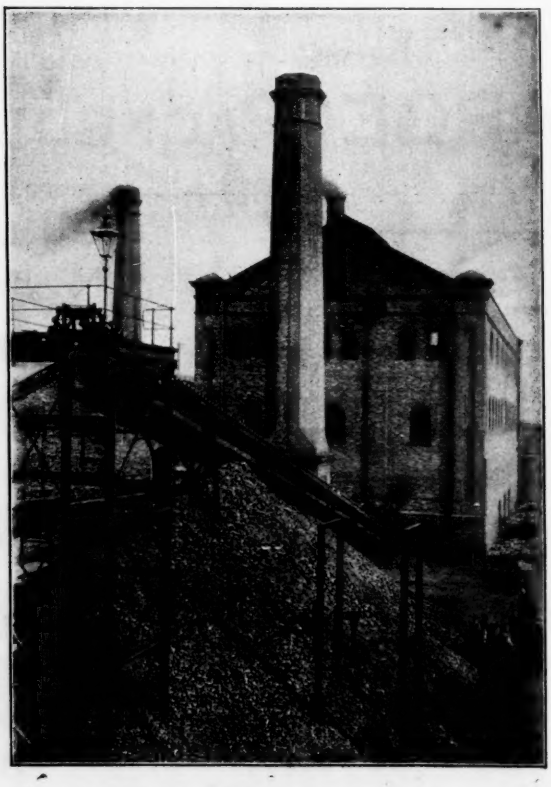

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The Great Ayton and District Gas and Water Company, Limited, has been registered with a capital of £10,000, in £1 shares, of which 3000 are 6½ per cent. cumulative preference, to acquire the business of a gas manufacturer carried on by F. Hawkyard as the Great Ayton and District Gas Company. The first Directors, of which there are to be not less than two nor more than five, are Messrs. J. H. Brearley, W. Hutchinson, and J. Hutton.

An exhibition of engineering models, optical, electrical, and scientific instruments, technical education appliances, and tools is to be held at the Royal Horticultural Hall, Vincent Square, Westminster, from Oct. 22 to 26 next. In addition to exhibits by the leading makers of the above-named goods, there will be a loan collection of interesting experimental and exhibition models and apparatus, and also lectures and demonstrations in various branches of Applied Science. The exhibition is being organized by Messrs. Percival Marshall and Co., of Poppins Court, Fleet Street, E.C.

Messrs. Bland and Co. learn from their Australian agents (Messrs. T. Glover and Co., Limited) that they have been successful in getting the "Bland" burners installed in St. Paul's Cathedral and the Bijou Theatre at Melbourne. In each place other inverted burners had been fixed; but, after comparative tests had been made, they were replaced by the "Bland" burners. The Bijou Theatre had for some years been lighted by electricity.

The Derby Town Council have accepted, on the recommendation of the Sanitary Committee, the tender of Messrs. Meldrum Bros., Limited, for the application of the Meldrum patent system of steam-jet forced draught to the existing destructor cells at their depôt, with a view to improving the working and capacity of the installation. The first two destructor cells, erected in 1876, and ten other similar cells at the Water Street depôt of the Manchester Corporation, were modernized by Messrs. Meldrum some five years ago; the efficiency and destroying capacity of the cells being thus greatly increased.

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No. 1.—"The Sanitary Aspects of Gas and Electric Lighting."
No. 2.—"The Cleanliness of Illuminants: The Eyesight."
No. 3.—"Fire Risks."
No. 4.—"The Relative Cost of Gas and Electricity, and Matters affecting it."
No. 5.—"On Reliability, with Instances of Misplaced Confidence."
No. 6.—"On Shop Lighting, with Special Reference to the Flame Arc Lamp."

This series of Leaflets will be useful, not only or distribution among Householders generally, but for circulation among Shareholders to fortify them with arguments in defence of the commodity in which they have invested capital. Copies of each Leaflet should also be kept in every Gas Undertaking's Show-Rooms.

Prices for Quantities on Application to WALTER KING, 11, BOLT COURT, FLEET STREET, E.C.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

ENGINEER AND MANAGER. Leek Urban District Council. Applications by June 24.
MANAGER. Banbury Gas Company. Applications by June 25.
WATER-WORKS MANAGER. Weymouth Water Company. Applications by June 24.
WORKS MANAGER, CONSTRUCTIONAL ENGINEERS. No. 4789.
TEACHER (GAS MANUFACTURE). Birmingham Municipal Technical School.
WORKING MANAGER. Soham Gas Company.

Situations Wanted.

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Licences for Manufacturing Patent Purifier Grids. No. 4787.

Plant (Second-Hand), &c., for Sale.

METERS (8.0-LIGHT). H.M. Dockyard, Portsmouth.
STATION METER. Whittington Gas Company.

Stocks and Shares.

ASCOT GAS AND ELECTRICITY COMPANY. June 24.
BARNET GAS AND WATER COMPANY. July 2.
BRENTFORD GAS COMPANY. June 24.
ILFORD GAS COMPANY. July 2.

Stocks and Shares—*continued.*

LEA BRIDGE GAS COMPANY. June 24.
LONDONDERRY GAS COMPANY. June 24.
NEW CONVEYOR COMPANY. No. 4781.
READING GAS COMPANY. July 2.
SEVENOAKS GAS COMPANY. July 2.
SOUTHEND WATER COMPANY. June 24.
ST. MARGARETS GAS COMPANY. July 2.
TOTTENHAM GAS COMPANY. July 2.
WEST HAM GAS COMPANY. July 2.
WORTHING GAS COMPANY. July 2.

TENDERS FOR

Boiler Plant, &c.

COVENTRY CORPORATION. Tenders by July 8.

Coal and Cannel.

BROADSTAIRS GAS COMPANY. Tenders by July 2.
CARLISLE GAS DEPARTMENT. Tenders by June 25.
CLACTON URBAN DISTRICT COUNCIL. Tenders by June 26.
COLWYN BAY AND COLWYN GAS DEPARTMENT. Tenders by June 26.
EXMOUTH GAS COMPANY. Tenders by June 29.
KESWICK GAS COMPANY. Tenders by June 19.
KIDWORTH GAS COMPANY. Tenders by June 29.
KINETON GASLIGHT COMPANY.
LONGTON CORPORATION. Tenders by July 2.
MARKET HARBOROUGH GAS DEPARTMENT. Tenders by June 22.

Coal and Cannel—*continued.*

PAIGNTON GAS COMPANY. Tenders by June 22.
RADCLIFFE AND PILKINGTON GAS COMPANY. Tenders by June 26.
ROCHESTER, &c., GAS COMPANY. Tenders by June 26.
SEDGLEY GAS DEPARTMENT. Tenders by July 4.
SOWERBY BRIDGE GAS DEPARTMENT. Tenders by June 24.
TEIGNMOUTH GAS DEPARTMENT. Tenders by July 1.

Oil for Gas Making.

ROCHESTER, &c., GAS COMPANY. Tenders by June 26

Refuse Destructor, Boiler Plant, &c.

COVENTRY CORPORATION. Tenders by July 8.

Retort-House and Wall.

LOWESTOFT GAS AND WATER COMPANY. Tenders by June 24.

Tar and Liquor.

KESWICK GAS COMPANY. Tenders by June 19.
LONGTON CORPORATION. Tenders by July 2.
PENRITH GAS DEPARTMENT. Tenders by June 25.
READING GAS COMPANY. Tenders by June 24.
ROCHESTER, &c., GAS COMPANY. Tenders by June 26.

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 799.

Issue.	Share.	When pay Dividend.	Dividend or Dividend & Bonus.	NAME	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
500,000	10	Apl. 11	10½	Alliance & Dublin 10 p.c.	20—21	..	5 0 0
268,324	10	,,	7½	Do. 7 p.c.	13½—14½	..	5 3 5
200,000	5	May 15	7	Bombay, Ltd.. . . .	6½—7	..	5 0 0
40,000	5	,,	7	Do. New, £4 paid	4⅝—5¼	..	5 6 8
50,000	10	Feb. 28	14	Bourne-mouth Gas and Water } 10 p.c.	27½—28½	..	4 18 3
51,810	10	,,	7	B 7 p.c.	16½—17	..	4 2 4
53,200	10	,,	6	Pref. 6 p.c.	15—16	..	3 15 0
380,000	Stk.	,,	12½	Brentford Consolidated	245—250	..	5 0 0
300,000	,,	,,	9⅜	Do. New . . .	188—193	..	4 18 5
50,000	,,	,,	5	Do. 5 p.c. Pref. .	117—122	..	4 2 0
206,250	,,	June 13	4	Do. 4 p.c. Deb. .	100—103*	+1	3 17 8
220,000	Stk.	Mch. 14	11¼	Brighton & Hove Orig.	220—225	..	5 0 0
246,320	,,	,,	8½	Do. A. Ord. Stk. .	160—165	..	5 0 0
460,000	20	Apl. 11	10	British	41—43	—1	4 13 0
104,000	Stk.	Feb. 28	6	Bromley, Ord. 5 p.c. .	119—122	..	4 18 4
165,700	,,	,,	4½	Do. do. 3½ p.c. .	90—93	..	4 16 9
500,000	10	May 15	7	Buenos Ayres (New) Ltd.	11—11½	..	6 1 9
250,000	Stk.	Dec. 13	4	Do. 4 p.c. Deb. .	95—97	..	4 2 6
150,000	20	Mch. 14	8½	Cagliari, Ltd.	25—27	..	5 17 10
100,000	10	June 13	10	Cape Town & Dis., Ltd.	11—13*	..	7 13 10
100,000	10	Apl. 26	4½	Do. 4½ p.c Pref.. .	8½—9½	..	4 14 9
50,000	50	May 2	6	Do. 6 p.c. 1st Mort.	50—52	..	5 15 5
50,000	Stk.	Dec. 28	4½	Do. 4½ p.c. Deb. Stk.	56—98	..	4 11 10
157,150	Stk.	Feb. 28	5	Chester 5 p.c. Ord. . .	109—111	..	4 10 1
1,443,280	Stk.	,,	5⅛	Commercial 4 p.c Stk. .	105—108	—2	4 16 4
560,000	,,	,,	5	Do. 3½ p.c. do. .	102—105	..	4 15 3
475,000	,,	June 13	3	Do. 3 p.c. Deb. Stk.	82—84*	+½	3 11 5
800,000	Stk.	,,	6½	Continental Union, Ltd.	112—117*	..	5 11 1
270,000	,,	,,	7	Do. 7 p.c. Pref.	136—141*	+1½	4 19 3
460,170	Stk.	—	5½	Derby Con. Stk. . . .	122—124	..	4 8 9
55,000	,,	Jan.	4	Do. Deb. Stk. . . .	103—105	..	3 16 2
486,090	10	Jan. 31	12†	European, Ltd. . . .	23½—24½	..	4 18 0
354,060	10	,,	12†	Do. £7 10s. paid	18—19	..	4 14 9
15,203,110	Stk.	Feb. 14	4⅛	Gas-light and Coke } 4 p.c. Ord. . .	91½—92½	+1	4 15 1
2,600,000	,,	,,	3½	3½ p.c. max. . .	87—89	..	3 18 8
3,799,735	,,	,,	4	4 p.c. Con. Pref.	102—105	+1	3 16 2
4,193,975	,,	June 13	3	3 p.c. Con. Deb.	82—84*	+½	3 11 5
258,740	Stk.	Mch. 14	5	Hastings & St. L. 3½ p.c.	95—100	..	5 0 0
82,500	,,	,,	6½	Do. do. 5 p.c.	116—119	..	5 9 3
70,000	10	Apl. 26	11	Hongkong & China, Ltd.	13—20	..	5 10 0
4,940,000	Stk.	May 15	8	Imperial Continental .	169—172	+2	4 13 0
473,600	Stk.	Feb. 14	3½	Do. 3½ p.c. Deb. Red.	93—95	..	3 13 8
184,602	Stk.	Mch. 14	6	Lea Bridge Ord. 5 p.c. .	110—120	—4½	5 0 0
306,083	,,	Dec. 28	4	L'rpool Unit'd Deb. Stk.	110—112	..	3 11 5

Issue.	Share.	When pay Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
561,000	Stk.	Feb. 28	10	Liverpool United A . .	223—225	..	4 8 11
718,100	,,	,,	7	Do. B .	163⅜—164½	—½	4 5 1
144,140	Stk.	Feb. 14	7⅞	Maidstone 5 p.c. . .	142—147	..	5 3 8
75,000	5	Nov. 29	5	Malta & Medn., Ltd. .	4¼—4⅝	..	5 5 3
560,000	100	Apl. 2	5	Met. of 5 p.c. Deb..	100—102	..	4 18 0
250,000	100	,,	4½	Melbourne 4½ p.c. Deb.	100—102	..	4 8 3
541,920	20	May 30	3½	Monte Video, Ltd. . .	10½—11½	—½	6 1 9
1,775,892	Stk.	Feb. 28	4⅜	Newc'tle & G'tesh'd Con.	135—107	..	4 6 5
406,025	Stk.	Dec. 28	3½	Do. 3½ p.c. Deb.	96—97	..	3 12 2
15,000	10	Feb. 28	10	North Middlesex 10 p.c.	19½—20½	..	4 17 7
55,940	1	,,	7	Do. 7 p.c.	13—14	..	5 0 0
300,000	Stk.	Apl. 26	8	Oriental, Ltd. . . .	143—148	..	5 8 1
60,000	5	Mch. 27	7	Ottoman, Ltd. . . .	6—6½	..	5 7 8
398,490	5	May 15	7	Primitiva Ord. . . .	6⅞—7⅛	..	4 16 7
756,980	5	Jan. 31	5	Do. 5 p.c. Pref. .	5—5⅛	..	4 15 3
488,900	100	June 1	4	Do. 4 p.c. Deb. .	93—95	..	4 4 3
1,000,000	10	Apl. 26	8	River Plate Ord. . . .	12⅞—13⅜	..	6 0 9
312,650	Stk.	Dec. 28	4	Do. 4 p.c. Deb. .	95—97	..	4 2 6
250,000	10	Mch. 27	8	San Paulo, Ltd. . . .	12½—13	..	6 3 1
125,000	50	Jan. 2	5	Do. 5 p.c. Deb. .	49—51	+1	4 18 0
135,000	Stk.	Mch. 14	10	Sheffield A	245—247	..	4 1 0
209,984	,,	,,	10	Do. B	245—247	..	4 1 0
523,500	,,	,,	10	Do. C	245—247	..	4 1 0
70,000	10	June 13	10	South African	15—16*	..	6 5 0
6,350,000	Stk.	Feb. 14	5½	South Met., 4 p.c. Ord.	121—123	..	4 9 5
1,895,445	,,	Jan. 16	3	Do. 3 p.c. Deb.	83—85	..	3 10 7
201,720	Stk.	Mch. 14	8	South Shields Con. Stk.	157—159	..	5 0 8
605,000	Stk.	Feb. 28	5½	S'th Suburb'n Ord. 5 p.c.	119—122	—1	4 10 2
60,000	,,	,,	5	Do. 5 p.c. Pref. . .	120—123	..	4 1 4
117,058	,,	Jan. 16	5	Do. 5 p.c. Deb. Stk.	125—130	..	3 16 11
502,310	Stk.	May 15	5	Southampton Ord. . .	105—110	..	4 10 11
120,000	Stk.	Feb. 28	6½	Tottenham and } A 5 p.c. .	123—126	..	3 3 2
398,940	,,	,,	5	B 3½ p.c. .	101—103	..	4 17 1
137,500	,,	Dec. 28	4	Edmonton } 4 p.c. Deb.	101—103	..	3 17 8
182,380	10	June 13	8	Tuscan, Ltd.	10½—10¾*	..	7 8 10
149,900	10	Jan. 2	5	Do. 5 p.c. Deb. Red.	102—104	..	4 16 2
193,742	Stk.	Feb. 28	5	Tynemouth 5 p.c. max.	106—108	+1	4 12 7
30,000	Stk.	Feb. 14	8	Wands- A 5 p.c. . .	—	..	—
255,636	,,	,,	6½	worth B 3½ p.c. . .	133—138	..	4 14 2
75,000	,,	,,	5⅝	and C 3½ p.c. . .	—	..	—
79,416	,,	Dec. 28	3	Putney 3 p.c. Deb. Stk	79—82	..	3 13 2
845,872	,,	Feb. 28	5⅝	West Ham 5 p.c. Ord. .	102—105	..	4 17 7
185,000	,,	,,	5	Do. 5 p.c. Pref. . .	120—123	..	4 1 4
228,300	,,	Dec. 28	4	Do. 4 p.c. Deb. Stk.	102—105	..	3 16 2

Prices marked * are "Ex div." † Next dividend will be at this rate.

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Twice as Rich as Bog Ore.
Gives no Back Pressure.
The Cheapest in the Market,
Can be Exchanged for Spent Oxide.
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Secretary.
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W. BOWLES BARRETT.
Clerk to the Company.
Weymouth, June 13, 1907.